

The Cultural Evolution of Normative Motivations for Sustainable Behaviour

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Abstract

An emerging literature on the evolution of culture can offer new explanations for how norms encourage or obstruct important sustainable behaviours. In particular, dual-inheritance theory describes how interactions between genetic and cultural evolution give rise, in part, to prosocial behaviour. Based on this theory, we identify the concept of *normative motivation*: internalized desires to follow and enforce norms. We discuss the utility of this concept in progressing two major research agendas across the social and behavioural sciences: the impact of motivation on cognition and normative behaviour, and the influence of norms on the policy process. Key contributions from this evolutionary perspective on normative motivation include: (1) an improved model of the motivations that lead individuals to follow descriptive norms, (2) clarification of how and when incentives generate intrinsic motivations for sustainable behaviours, and (3) new ideas for leveraging the influence of norms in public policy beyond financial incentives and education campaigns.

1. Introduction

Sustainability often requires prosocial cooperation, which is costly to the actor but beneficial for others. The dual-inheritance theory of gene-culture coevolution provides a comprehensive and sophisticated account for explaining prosocial cooperation in humans. In this Perspective, we consider the implications of this account for goals of sustainability, with a focus on its conceptualization of norms, or “learned behavioural standards shared and enforced by a community”¹. In particular, we draw from dual-inheritance theory’s description of the human evolution of a “norm system”, and its resulting capacities of *normative motivation* - internalized desires to follow and enforce norms^{1,2,3}.

A large literature indicates that norms can powerfully encourage or obstruct sustainability practices^{4,5}, but several challenges remain. Our evolutionary perspective on normative motivation offers new ideas regarding several specific challenges. First, we examine the relationship between norms that are *descriptive* - based on statistically common behaviours - and those that are *injunctive* (or *prescriptive*) - behaviours that are approved or disapproved of within a given community (Figure 1)^{6,7}. Second, we clarify interactions between *instrumental* (*extrinsic*) motivations to follow norms, driven by incentives or sanctions, and *intrinsic* (*personal*) motivations, driven by personal commitment^{4,5}. Finally, we discuss *interactions of norms with public policies*⁸, both in terms of how norms influence policy creation and implementation, as well as how policies influence norms^{5,6,9,10,11,12}. This account illuminates important opportunities for policy interventions and other applications for increasing sustainable behaviour. Through the lens of dual-inheritance theory, we see new explanations for old puzzles in this research, and new opportunities for future research.

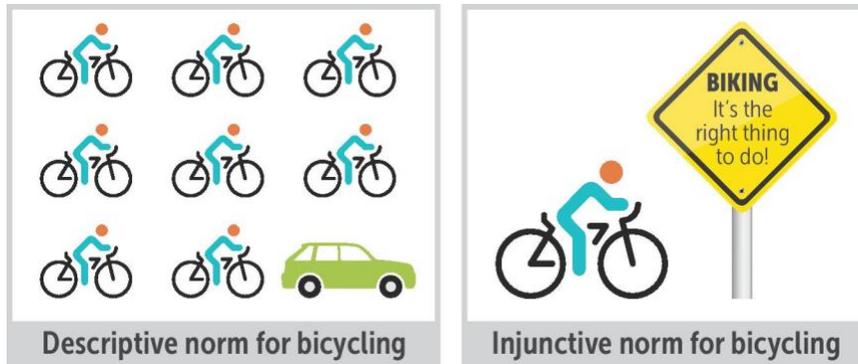


Figure 1: Descriptive vs. Injunctive Norms. Descriptive norms are behaviours that are common, or that occur frequently, within a population (i.e., what people *do*). The left panel depicts a community in which bicycling is more common than driving, and information about such norms influences individual behaviour. Descriptive norms imply nothing about enforcement, or about what is right or wrong. Injunctive (or prescriptive) norms, by contrast, refer to behaviours that are approved or disapproved within a community (i.e., what people *should* do). An injunctive norm for bicycling would be expressed through communications such as signage indicating that biking is the “right” or approved way to travel, as in the right panel. Thus, because descriptive norms are not enforced, the construct “norm” according to dual-inheritance theory is reserved only for injunctive norms.

2. Gene-Culture Coevolution and Normative Motivation

2.1. Dual-Inheritance Theory

Historically, theories of cooperation have focused on *genetic evolution* through natural selection, assuming that costly forms of behaviour must have increased genetic fitness overall¹³, at least during evolutionary history, if not in the present¹⁴. Although such theories explain important aspects of human cooperation that are shared with other animal species, they do not explain unique aspects of human cooperation relevant to social dilemmas, which often reduce individual fitness overall^{1,15}. For this, it is necessary to supplement appeals to genetic evolution with appeals to cultural evolution.

According to the *dual-inheritance theory* of evolution, social learning is a non-genetic form of inheritance that gives rise to a distinct, non-genetic process of *cultural selection*. “Culture” here refers specifically to the psychological traits that individuals acquire, or inherit, through social learning. Once a process of selection acting on cultural traits has arisen, it opens up the possibility of causal interaction between cultural selection and genetic selection (see Figure 2). Our history of genetic selection influences which cultural traits spread and remain stable, and our history of cultural selection influences which genetic traits spread and remain stable^{16,17}. For example, genetic selection pressures that eventually gave rise to adaptations for digesting milk were the result of cultural selection acting on pastoralist practices and dietary choices¹⁸.

We focus specifically on the co-evolutionary relationship between culturally inherited norms, on one hand, and genetically inherited motivations for following and enforcing norms, on the other. Norms are behavioural rules and standards (i.e., enforced injunctions) that are transmitted culturally, rather than genetically^{1,2,16,17,19}, and selection acting on such culturally inherited practices can, in some cases, maintain them for thousands of years (e.g., rules against murder and theft enforced by execution or imprisonment, as extreme cases). As described in Figure 2, these social punishments and rewards then create new genetic selection pressures, favouring psychological adaptations for negotiating an environment filled with norms^{1,3}. We refer to these psychological adaptations collectively as the *norm system*, which is composed of distinct capacities of norm cognition, norm motivation, and norm acquisition. Regarding motivation, we focus on capacities for intrinsic motivation to follow and enforce norms, which we refer to as *normative motivations* to distinguish them from other forms of intrinsic motivation, such as hunger, thirst, or fear. Regarding acquisition, our focus is on the

internalization of such motives; the processes through which normative motivations arise, through social learning and development.

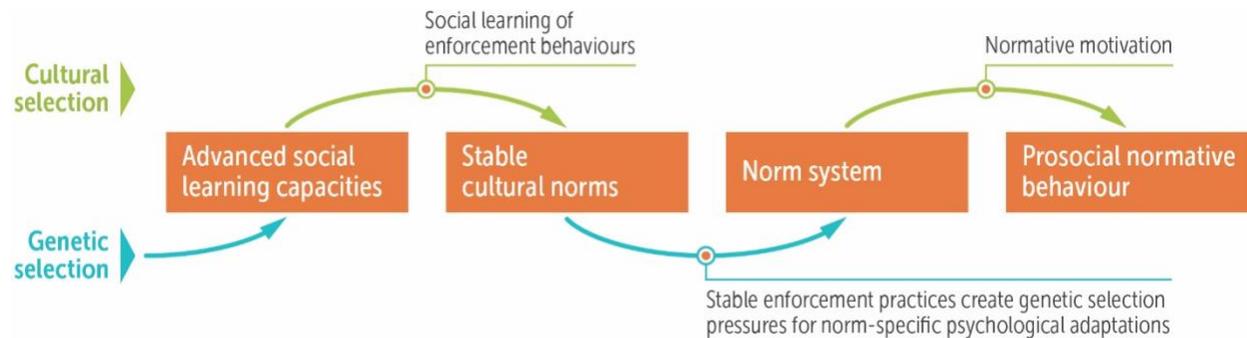


Figure 2: Dual-Inheritance Theory of Normative Motivation. Beginning in genetic evolution, selection in the human lineage produced highly sophisticated capacities for social learning, or cultural inheritance. Among other things, individuals learned from others how to control others’ behaviour through enforcement, using social rewards and punishments structured by concepts of rightness and wrongness. Cultural selection acting on these norms created powerful and stable genetic selection pressures, sometimes favouring costly, prosocial behaviour. The norm system, and normative motivations specifically, arose from these genetic selection pressures. Once they evolved, they supported further cultural selection for prosocial cooperation – at a level not observed in other species – across anonymous individuals who are not genetically related, and not engaged in mutually beneficial exchange relationships.^{1,15.}

3.2 Normative Motivation

In the context of sustainable behaviours, one of the most important traits of the norm system is the capacity to produce *intrinsic* motivations to follow and enforce norms. These are motivations to “do the right thing” just because it is right, and not as an instrumental means to avoid punishment or gain social rewards. For example, some people are motivated to avoid harming endangered species only due to instrumental fear of fines or jail, whereas others are motivated by an intrinsic motivation to avoid doing something wrong²⁰. From a dual-inheritance perspective, only intrinsic motivation is truly a normative motivation, and we reserve the term

“internalization” specifically for the acquisition of such intrinsic motives. This internalization capacity is a unique psychological consequence of gene-culture coevolution.

The distinction between instrumental and intrinsic motivations for following norms has been marked elsewhere in social science, but three points of clarification are important. Schwartz distinguishes between “social norms” and “personal” or “moral norms,” such that social norms are followed out of instrumental motivation, whereas personal/moral norms are those followed out of intrinsic motivation²¹. Influential theorists such as Stern and colleagues²², and Bicchieri⁶, have followed his lead. However, we prefer the labels “instrumental” and “intrinsic” to clarify that any particular norm (e.g., to protect endangered species) may be adhered to for either instrumental or intrinsic (internalized) reasons. We also clarify that not all matters of right and wrong are *moral* issues: people are also intrinsically motivated to follow non-moral norms, such as rules of etiquette²³. Finally, we emphasize that not all *intrinsically* motivated behaviours are *normatively* motivated. For instance, using a bicycle for transportation may be intrinsically motivated by the enjoyment of biking, but this is not the result of a socially enforced norm or a belief that biking is the “right” thing to do. Thus, effects such as “warm glow”, in which pro-environmental behaviour leads to positive affect, are not necessarily the result of acting in line with internalized norms²⁴.

Because normative motivations can entail engaging in a behaviour that does not support individual genetic fitness, it may seem surprising that such motivations are thought to have been favoured in evolution. However, work on dual-inheritance theory has concluded that consistent normative motivations are actually more adaptive than instrumental calculations about the risk of sanction or payoffs for violating norms in each situation^{2,25}. Because of humans’ capacities for language, and their interest in gossip, such a calculated strategy is risky: one miscalculation can

result in severe and long-lasting damage to one's reputation, reducing access to group resources, and increasing risk of punishment. Consistent adherence to learned behaviour through normative motivation has thus been argued to be a more effective strategy^{2,25}.

Dual-inheritance theory offers useful insights into the mechanisms of internalization. While in some cases internalization involves extended periods of learning and reinforcement, a growing body of theory and evidence suggests that internalization is often intuitive and automatic, especially in children³. If normative motivations are more adaptive than instrumental motivations for following norms, then this rapid "norm acquisition" mechanism is a valuable genetic adaptation. Schmidt and colleagues thus claim that young children are "promiscuous normativists," who "go from observed actions to prescribed actions and do not perceive them simply as guidelines for their own behaviour but rather as objective normative rules applying to everyone equally."²⁶ The same norm acquisition mechanism is evident also in the phenomenon of *overimitation*—when copying a sequence of actions directed toward a specific goal, people often copy causally irrelevant actions. A growing body of studies shows that overimitation is rooted in the psychology of norms: instead of reasoning instrumentally about the function of each step in a sequence, children assume that there is simply a right way to do things, and they internalize such normative structures directly and automatically upon observation^{26,27}.

Others have considered how children identify cultural models, or individuals worthy of imitating^{15,28,29}. They discuss such factors as the model's social status and similarity to the learner (e.g., gender, proximity in age, group membership). They also note that learners are sensitive to the functional domain of the behaviour being imitated, rather than simply copying anything that a good model does. Although these studies address the acquisition of cultural traits in general, they suggest that the same variables should also be examined to better understand the

process of internalizing norms. Identifying which factors are more important in identifying appropriate “cultural models” for imitation, or for determining the “functional domain” of a normative behaviour, is crucial to spreading adoption of sustainability norms. Dual-inheritance theory offers some general insights in this respect, and generates new questions about how other factors, such as message framing or celebrity status, might increase normative motivations with respect to sustainability norms.

3. New Perspectives on Norms and Sustainable Behaviour from Dual-Inheritance Theory

3.1 Descriptive Norms vs. Injunctive Norms

Many studies have suggested that descriptive norms can be effective in producing behaviour change^{4,6,30,31,32}. At the same time, research indicates that descriptive norms interact with injunctive norms in complex ways. For example, injunctive norms are more effective at motivating behaviour among those who are performing better than the descriptive norm³², or at the early stages of the “norm cycle”³³ when a new behaviour has not yet been widely adopted^{9,30}. This raises important questions about why people are inclined to follow descriptive norms in the first place.

We suggest that the cultural evolutionary perspective can help to distinguish two explanations for why people follow descriptive norms (see Figure 3): self-interest vs. injunctive inference. Cialdini, Kallgren, and Reno describe the *self-interest hypothesis*: “Descriptive norms motivate by providing evidence as to what will likely be effective and adaptive action” (p. 203)³⁰. Here, a descriptive norm has no connection to social approval, it serves only as a heuristic for self-interested decision making. By contrast, a descriptive norm can also be

interpreted as evidence for an underlying injunctive norm. According to this *injunctive inference hypothesis*, norm acquisition mechanisms lead to inferences about the presence of injunctive norms from observed behavioural regularities. Accordingly, we argue, descriptive norms may often activate motivations associated with injunctive norms^{4,6}. We are unaware of any work on descriptive norms that specifically tests the injunctive inference hypothesis against the self-interest hypothesis, yet this is a critical distinction for motivating behaviour change.

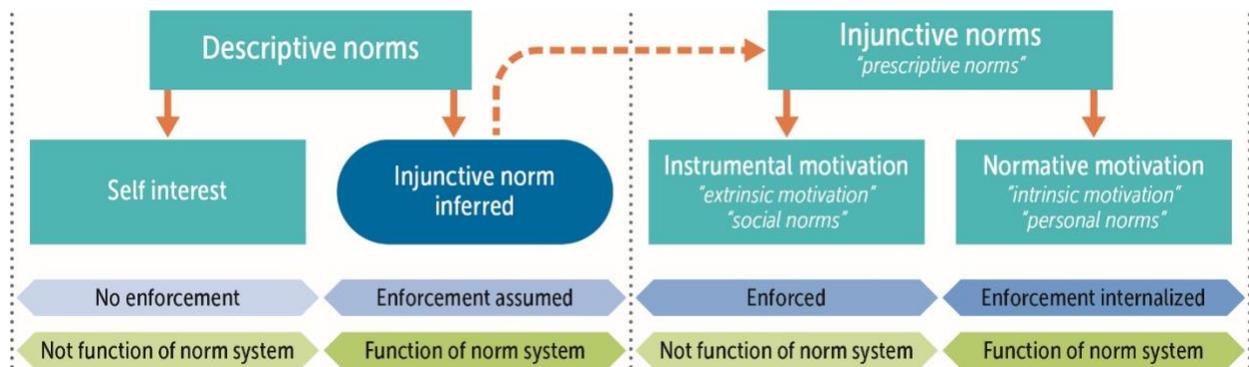


Figure 3: Motivations for Following Descriptive versus Injunctive Norms. Descriptive norms are statistically normal behavioural regularities. In some cases, these regularities are interpreted to indicate that a behaviour is likely to be beneficial to one’s self interest. This kind of self-interested motivation is not a form of normative motivation, and is not issued by the norm system. For instance, upon learning that most of their colleagues bike to work, an individual may infer that biking to work is more convenient than driving. In contrast, injunctive norms (sometimes referred to as prescriptive norms) are normative, providing information about what individuals within a community *should* do. Injunctive norms are instrumentally (or extrinsically) motivated if they are adhered to in order to gain social approval or avoid social punishment. For instance, an individual may bike to work because her colleagues criticize her for driving. Injunctive norms that have been internalized are independent of instrumental concerns about social sanction and are referred to as normatively motivated (also known as being “intrinsically motivated” to comply with norms or as “personal norms”). For instance, an individual may bike to work because they value environmental sustainability. Finally, as a result of the norm system, individuals may infer the presence of an injunctive norm from the descriptively normal behaviour of others. In this case, either instrumental or normative motivations may affect subsequent behaviour.

Consider how the self-interest and injunctive inference hypotheses apply to a widely cited example of the power of descriptive norms to shape sustainable behaviour. An ingenious field

experiment asked guests in a hotel room to “help save the environment” by reusing their towels³¹. Guests who were additionally informed that 75% percent of other guests reused their towels complied at significantly higher levels than those who only received the injunctive message. The authors explain this result in terms of the self-interest hypothesis and do not consider the competing alternative of the injunctive inference hypothesis. The injunctive inference hypothesis is arguably more plausible, however: purely self-interested benefits of towel reuse appear to be limited, whereas participants could easily have inferred an injunctive norm of conservation from this behavioural regularity.

Participants might then have followed the inferred injunctive norm for either of two reasons, as in Figure 2. If they were worried about being judged or punished for not following this norm, they might have reused their towels out of instrumental motives. Alternatively, their inference of the existence of a conservation norm may have engendered intrinsic, normative motivations to conserve water, consistent with the norm system described in Section 2. The study provides some evidence for the normative motivation explanation: When the other guests choosing to reuse their towels were described as previous occupants of the *same room*, rather than occupants of the same hotel, the increase in towel reuse was even greater. Mechanisms of overimitation are sensitive to (potentially arbitrary) similarities between the practical contexts of the cultural learner and the cultural model, such as occupying the same hotel room. Thus, the cultural evolutionary perspective provides new motivational accounts for the power of “descriptive” norms in even well-known cases such as this.

Many studies of descriptive norms related to energy conservation also do not distinguish between the self-interest and injunctive inference hypotheses, leaving important questions about the nature and durability of the observed behaviour changes. Consider widely cited experiments

in which informing high energy consumers about descriptive norms decreases consumption^{32,35}. These results are consistent with both the self-interest hypothesis and the injunctive inference hypothesis. Because reducing consumption also reduces one's own energy costs, high energy consumers may have used descriptive norm information as a heuristic for self-interested behaviour. Such behaviour may or may not continue after the message is removed, depending on the actual energy savings of the consumer. Alternatively, the descriptive norm may have led consumers to infer an injunctive norm regarding energy conservation, which they chose to follow either due to fear of sanction or due to a new, intrinsic motivation. For instance, Schultz and colleagues (2007) found, in part, that individuals who learned that their energy consumption was below average subsequently reduced their consumption to the same extent whether they had received a descriptive or an injunctive message³². The fact that high energy consumers showed no additional improvement in response to an injunctive norm cue may suggest that information about the descriptive norm alone is sufficient, through injunctive inference, for activating the mechanisms of injunctive motivation.

We propose that psychology can offer several means for empirically differentiating the self-interest and injunctive inference hypotheses. First, if descriptive norms merely convey information about probable self-interest, then motivations to comply with the norm should easily extinguish upon receipt of countervailing information (e.g., discovering that reducing energy consumption has little effect on financial savings). In contrast, if the behaviour reflects a normative motivation, we should see resistance to countervailing information. Such phenomena are easily observed in the context of environmentally harmful norms. For example, injunctive masculinity norms produce resistance to information about the environmental costs of eating meat³⁵.

Normative motivation should also shape reasoning³⁶, often leading to justification or rationalization of the normative behaviour as well as perceptual or cognitive distortion of the behaviour and its implications. For instance, individuals who associate eating meat with internalized norms of masculinity are likely to engage in “motivated reasoning” that downplays the environmental harms associated with raising livestock³⁷. Motivated reasoning is generally self-protective, non-consciously encouraging a lived experience that minimizes threats to one’s ego, intimate relationships, and social identity. Some scholars have argued that this mechanism supports individual genetic fitness³⁸, but in the case of norms, motivated reasoning may offer a related selective benefit at the level of the cultural group. When prosocial norms are internalized, normative motivations may help direct individuals toward personally costly forms of cooperation. This may occur via motivated reasoning that exaggerates the frequency or magnitude of sanctioning, that exaggerates the attractiveness or appropriateness of the behaviour, or that exaggerates the descriptive frequency of norm adherence among others. Indeed, the fact that failure to behave normatively frequently leads to internal emotions of guilt or shame indicates that humans have evolved systems for self-sanctioning, or “internal sanctions”³⁹. The combination of motivated reasoning that directs information processing in favour of norms, and self-sanctioning responses that internally punish norm violations, would together be beneficial for groups, because it would increase prosocial cooperation without requiring other group members to pay the costs involved in regulating or incentivizing the behaviour.

Thus, we argue, a dual-inheritance perspective on norms could allow future research to better distinguish among the distinct psychological processes involved in compliance with descriptive norms. For instance, future work might examine (a) whether, or under what conditions, individuals spontaneously infer enforcement from statistically common behaviours,

(b) the persistence of normative behaviour in the presence of countervailing information about self-interest, or (c) whether norms bias reasoning. Insights about norm acquisition from dual-inheritance theory and the psychological literature on motivation can propel the development of empirical research on the complex relationship between descriptive and injunctive norms.

3.2 Instrumental vs. Normative Motivations

Psychologists and social scientists have long marked the distinction between instrumental and intrinsic motivations^{40,41}. A number of researchers have suggested that sustainable behaviour may be guided by either form of motivation, if not both, but their relative and interactive impacts are unclear^{4,5,8,42}. In some cases, instrumental motivations appear to facilitate norm internalization, such that some desired behaviour continues even when the incentive is withdrawn⁸. In other cases, however, incentives “crowd out” stronger intrinsic motivations, reducing the desired behaviour quickly after the incentive is removed^{41,42,43}. In light of these results, understanding the relationship between instrumental and intrinsic motivations and the process of norm internalization is important for using norms to increase sustainable behaviour (see Figure 3). This is particularly true because internalized motivations are more resilient to change, and do not require governments and other institutions to pay the costs of providing incentives and regulations.

Here again, insights arising from dual-inheritance theory provide a useful new perspective. One key factor in norm compliance is the observability of the behaviour. Research has found that people are more likely to volunteer to limit energy consumption during peak hours—a costly, prosocial act—when their decisions can be observed by neighbours⁴⁴. This study also illustrates how instrumental and intrinsic motivations to follow a norm can be

measured independently, by comparing the percentage of volunteers who signed up in the “anonymous” versus “observable” experimental conditions. Manipulations of observability thus provide a useful method for separating these two types of motivation. When instrumental motivations are provided instead in the form of a cash payment, however, they appear to “crowd out” existing normative motivations⁶. Residents’ willingness to support the location of a nuclear waste facility in their immediate community, for instance, declined dramatically when the decision included a substantial cash payment⁴². The instrumental motivations from the payment apparently transformed the decision into an economic transaction, crowding out normative motivations of civic duty.

Previous scholars have offered at least three potential theories about the processes through which norm internalization might be stimulated by instrumental incentives. One hypothesis draws from the theory of cognitive dissonance. On this view, individuals come to internalize motives that were initially based on extrinsic incentives, in order to increase consistency between their values and their actions⁸. A related perspective suggests that behaviour change following external “nudges”⁴⁵ leads to internalization, because individuals infer from their behaviour that they must value recycling after all⁴⁶. The third hypothesis draws from the theory of associative learning. According to this perspective, people possess a basic need for social approval, such that consumption that brings such approval is intrinsically rewarding. Through associative learning, behaviours that are initially rewarding only because of social approval gradually become internalized⁴⁷.

We acknowledge these empirical possibilities, but emphasize that the motivations they posit are not normative in the sense outlined by our presentation of the dual-inheritance model. Even if individuals internalize a desire to engage in some behaviour, it does not follow that they

take this behaviour to be a matter of right and wrong, or that they would enforce such behaviour on others. Thus, the cognitive dissonance, self-perception, and associative learning hypotheses are each insufficient to explain the internalization of *norms*, even if they succeed in explaining the internalization of other motives^{3,26,27}.

From the perspective of dual-inheritance theory, instrumental motivations have other possible relationships with normative motivations that merit more exploration. For instance, a new behavioural regularity that is initially established using instrumental incentives might later be interpreted, according to the injunctive inference hypothesis, as evidence of an injunctive norm, leading to the generation of normative motivations. In addition, although monetary payments risk “crowding out” effects, non-pecuniary efforts to increase adherence to a norm, such as by making a behaviour more convenient, or drawing attention to those who are following the norm, might increase pro-environmental behaviour without crowding out normative motives^{5,8,34}. This is a very different account of how norms for sustainable behaviour are acquired, which raises interesting questions about what types of non-monetary incentives are most effective at spurring norm internalization. For instance, what types of instrumental incentives, in what practical contexts, are capable of generating behavioural regularities that will subsequently lead to injunctive inferences? How long must these incentives be administered in order to effect the internalization of these inferred injunctions? Rather than providing monetary incentives to bike vs. drive (e.g., by raising gas prices or parking fees), for example, the combination of the injunctive inference hypothesis and dual-inheritance theory suggests that simply making biking more noticeable might be an effective strategy for increasing norm internalization.

3.3 The Policy-Behaviour-Norms Nexus

There have been prominent calls to better understand the so-called “policy-behaviour-norms nexus”⁸. Leading perspectives on this topic, for example, have advocated an increase in public policies aimed at strengthening sustainability norms through education and incentives^{5,8,30,34}. Our discussion of the development of normative motivations based on dual-inheritance theory calls into question the centrality of these education- and incentive-based strategies. Although incentives are an important policy option, Section 3.2 illustrates how the effectiveness of such policies will depend upon which motivational mechanisms generate commitments to a particular behaviour. Thus, we review a few other important ways governments can promote sustainability norms, beyond simply providing new instrumental incentives.

Consistent with dual-inheritance theory, opportunities for *social* learning may be more effective than government education programs or incentives for generating normative motivations for a behaviour. For instance, in some cases simple awareness of new policies or actions increases public support for important norms. For example, Supreme Court rulings ratifying controversial social policies have been shown to generate increased public support for norms against discrimination, presumably because individuals infer that the rulings must be the result of increased and socially enforced support by others⁴⁸. This can in turn generate support for new formal policies consistent with these changing norms, potentially creating a “virtuous cycle” of social change that does not depend on instrumental enforcement.

In addition, governments can support new norms by allowing smaller groups to create “model communities,” which have freedom to develop new norms with less fear of sanctions from the majority group in society^{6,9}. Many sustainability norms, addressing behaviours ranging from recycling to vegetarian diets, began in just these sorts of model communities, before

disseminating to the wider culture. By having the freedom to innovate, and the ability to demonstrate the advantages of successful new norms to other groups, model communities may create important opportunities for imitation by others, in a manner consistent with cultural selection mechanisms⁴⁹.

Once enough trendsetters have adopted a new norm, learning capacities for adopting the most frequent and trending cultural traits may propel population dynamics toward a “tipping point,” where the norm becomes rapidly adopted in what some call a “norm cascade”³³. Here, evidence of “emerging” norms stimulating imitative behaviour is also important in suggesting that norm adoption by even a *minority* of society can stimulate wider adoption—as long as this minority is growing⁵⁰. Thus, better understanding how policies can protect and encourage model communities, and facilitate diffusion of “trending” or “dynamic” sustainability norms into the larger society, merits greater attention.

Another important factor in the diffusion of these new norms is the degree of “shared identity” between a model community and members of the greater society. In large and complex modern societies, humans are simultaneously members of many different reference groups, which have different, sometimes contradictory norms. Recognizing the multiple cultures in which individuals are embedded may also illuminate which interventions are likely to be more effective in activating the normative motivations of different referent groups.

An equally important line of research that has received less attention from researchers considering sustainable behaviours considers how norms shape sustainability policies, rather than examining only how policies shape norms. This work has shown, for example, that norms are important for *compliance* with a range of sustainability policies^{11,51,52}. Because of the power of norms over behaviour, formal rules are unlikely to be followed in practice if they conflict with

other prominent norms. In addition, scientists have documented the importance of norms in the *creation* of new sustainability policies^{10,12,53,54}. Thus, research on the “policy-behaviour-norms nexus” should pay greater attention to how norms affect implementation or adoption of sustainability policies, in addition to how policies affect sustainability norms.

A critical question in this domain concerns the potential for “normative reframing”¹². Presenting a new policy as consistent with an important norm can increase pressure on government actors to adopt the policy^{22,55}. For example, new normative arguments have influenced the design and adoption of both international and domestic climate change policies^{10,12,53}. In order for a new norm to successfully influence policymaking, it must be broadly perceived as convincingly applied to the situation. Research has shown that framing even deeply controversial policy issues in terms of an alternative norm, which also “fits” the issue¹², can influence public opinion⁵⁶ and policy choices¹². For instance, Feygina, Jost, and Goldsmith⁵⁵ found that framing environmentalism as patriotic, and critical for preserving the American way of life, improved pro-environmental intentions and attitudes toward contentious policy issues such as cap-and-trade. Similar patterns are observed in non-environmental contexts, such as same-sex marriage - where an “equality/tolerance” frame has been associated with a substantial increase in public support - or the death penalty - where an “innocence” frame stressing the risk of killing even one suspect who is not guilty has been associated with decreased public support for capital punishment^{56,57}. This strategy of normative reframing is also important for increasing compliance with existing rules, such as protections for endangered species on private lands²⁰.

Such work raises a vital research question: Why does normative framing work in some policy cases, and not others? Research on human rights has grappled with this question in a

limited manner, finding that human rights norms addressing direct and significant bodily damage (e.g., torture or extra-judicial killings) gain more support than those addressing more indirect “positive” rights such as to education or a sufficient livelihood⁵⁸. There are good evolutionary reasons for this pattern, which have important implications for using norms to justify new sustainability policies. For example, from an evolutionary perspective, invoking norms related to bodily harm may be a particularly effective frame because large-scale cooperation would be fundamentally threatened if individuals lived in perpetual fear of bodily harm by their cooperative partners. These aspects of norm psychology, and the evolutionary dynamics that shape it, illustrate the importance of focusing on the motivational mechanisms activated by different ways of framing sustainability policy in specific cultural contexts.

4. Conclusion

Humans’ contemporary psychological norm system is largely structured by the role norms have played throughout our evolutionary history in establishing and maintaining cooperation, including prosocial cooperation. Because many sustainable behaviours are also forms of prosocial behaviour, an improved understanding of the cultural evolution of norm psychology offers important opportunities for identifying interventions and applications designed to increase sustainable behaviour. Our aim here has been to identify some of the most direct and important links between dual-inheritance theory and existing research in the social science of sustainability. In particular, we have sought to clarify contexts in which descriptive (vs. injunctive) norms are likely to lead to behaviour change, the conditions under which incentives lead to persistent patterns of behaviour, and the ways governments can best use norms and normative motivation to help promote sustainable behaviour. We are optimistic that as we develop a more detailed

understanding of the factors that determine how normative motivations arise, we will also be able to identify a wider range of effective and long-lasting solutions to the problems of motivating sustainable behaviour.

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