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A Neuroaffective Perspective on Why People Fail to Live a Sustainable Lifestyle

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A sustainable and environmentally friendly lifestyle provides a never-ending supply of everyday decisions: Do I leave the tap on or off while I shave? Should I buy the expensive energy-saving light bulbs? Should I drive to work or take the bike? Should I become a vegetarian? Although seemingly easy and minor, the mere number of decisions requires us to constantly be on guard; a sustainable lifestyle asks for strong self-control. When we are interested in whether or not a particular individual will act according to sustainable and pro-environmental standards, we need to ask two important questions. First, does this person have strong enough pro-environmental values required to motivate pro-environmental behavior? Second, does this person have the capacity to suppress their egoistic needs and change their behavior to act according to their pro-environmental values?

THE NATURE OF SELF-CONTROL

Although many people care about the environment and adopt goals to act in a sustainable and pro-environmental way, only a few people actually follow through with their good intentions. What is it that enables these people to overcome their selfish and immediate needs, such as enjoying the comfort of driving, experiencing the thrill of consuming, or running the air conditioning at full blast? Most likely, what distinguishes those who follow through with their good intentions as opposed to those who do not is the effectiveness of their self-control mechanisms.

Self-control refers to the mental effort individuals use to bring their own behavior in line with a preferred state—a goal (Muraven & Baumeister, 2000). When we engage in self-control, we effortfully override a predominant response, such as the urge to eat the steak, with another behavior, such as choosing the veggie stir fry, in order to attain a goal, such as maintaining a vegetarian diet. According to cybernetic models of self-control (Wiener, 1948; see also Carver & Scheier, 1981), the goal serves as a reference value to which a monitoring process compares the current state. If this comparison detects a discrepancy between the goal and the current state, an error signal is sent out to an operating system, and attempts to change the current state are initiated. The new state is then again compared to the goal and, if necessary, further change is initiated. As long as this process reduces the discrepancy fast and efficiently, it runs smoothly and automatically. However, if the discrepancy remains and the goal is blocked, for example, when there are no vegetarian options on the menu, negative emotions arise and the process soon becomes conscious and effortful (Carver, 2004). In the same way, when the process reduces the discrepancy at a pace faster than expected, we feel positive emotions. Therefore, emotions are an essential part of self-control. Their general purpose is to help the organism to meet challenges and opportunities (Levenson, 1994). Emotions, in other words, are for acting; we experience emotions when something important is at stake; they are what motivates us to strive for a goal in the first place, and we become painfully aware of them when a goal is blocked (Lewis & Todd, 2005).

Effective self-control, therefore, requires four components. First, we need a clear and specific goal; second, we need emotions to energize and motivate self-control; third, we need an intact monitoring system that is vigilant and can correctly identify any differences between the goal and the current state; and finally, we need an intact operating system that can initiate the necessary changes.

In this chapter we propose that strong moral values are beneficial to self-control because violations of moral values result in strong emotional reactions, motivating people to engage in self-control in order to correct the situation. Moreover, strong moral values can automate the self-control process, thus saving resources and making the process more efficient. We further propose that our brains evolved in a way that certain kinds of moral values elicit stronger emotional reactions than others, and thus can motivate sustainable behavior better. Finally, we propose that one particular kind of moral value—the values related to purity and sanctity and the associated emotion of disgust—is an especially powerful motivator for sustainable behavior. We will begin by taking a closer look at the neural processes underlying self-control in order to gain a deeper understanding of how emotions influence it.

SELF-CONTROL IN THE BRAIN

To learn about the neural mechanisms of self-control, we take a look at the four components of self-control—the goal, the emotions, the operating process, and the monitoring process. Goals are represented in memory and therefore depend on the brain structures involved in semantic memory such as the hippocampus and its surrounding areas, the medial temporal lobe, the diencephalon, and the basal forebrain (Zola-Morgan & Squire, 1993). Since the specifics of the neural mechanisms involved in memory would not provide any further insight into self-control, we will not elaborate on these mechanisms further.

The functional neuroanatomy of emotions is complex and includes evolutionarily very old regions, such as the brain stem and hypothalamus, and relatively new and more flexible structures in the cerebral cortex (Todd & Lewis, 2008). The brain stem, the evolutionarily oldest part of the brain, includes nuclei that are responsible for our most basic motivational drives. These drives can be organized in four basic systems (Panksepp, 1998): the seeking system, which underlies appetitive approach behaviors; the rage system, which is triggered by frustrated goals; the fear system, which is associated with avoidance behavior; and the panic system, which underlies attachment behaviors. The brain stem produces neurochemicals, such as dopamine and norepinephrine, which allow the drives to influence other, higher-order brain areas including the hypothalamus that might trigger a stress response and release stress hormones into the bloodstream (Panksepp, 1998), and the limbic system that modulates behavioral responses and is involved in memory and learning (Tucker, Derryberry, & Luu, 2000). Finally the cortex is also involved in emotional processing. Especially the paralimbic structures, such as the anterior cingulate cortex (ACC) and the ventral prefrontal cortex (V-PFC), receive emotional signals from the brain stem and the limbic system and use this information to modulate attention, perception, and action (Bechara, Damasio, & Damasio, 2000). Through the paralimbic system, the subcortical structures can subtly influence cognitive processing such as decision making and behavioral control in service of the ancient basic drives that set the agendas for behavior. This bottom-up flow of emotional action tendencies provides the energy and direction for behavior and, at the same time, the top-down control processes ensure that we do not inflexibly follow our impulses and basic reflexive behavior (Tucker et al., 2000).

The monitoring and control of behavior is associated with activation in the dorsolateral prefrontal cortex (DLPFC; Spence & Frith, 1999)—predominantly associated with control processes—and two paralimbic cortical regions: the orbitofrontal cortex (OFC) and the ACC (Bechara, Damasio, Tranel, & Damasio, 1997; Botvinick et al., 2001; Kerns, Cohen, MacDonald, Cho, Stenger, & Carter, 2004; Ochsner et al., 2004), predominantly associated with monitoring processes.

The DLPFC has been associated with planning, working memory, selective attention (Chao & Knight, 1998), and most importantly, the selection and initiation of action (Spence & Frith, 1999). Consequently, damage to the DLPFC results in apathy (Dimitrov et al., 1999). As paralimbic structures, the ACC and the OFC receive input from subcortical brain areas, such the limbic system and the brain stem (Paus, 2001) and are also connected to prefrontal areas. The OFC is implicated in reward and inhibition processes (Elliott, Dolan, & Frith, 2000), specifically in monitoring reward values and suppressing previously rewarding responses that no longer are associated with reward (Elliott et al., 2000). The ACC is involved in conflict monitoring and error detection and is part of a circuit that regulates both cognitive and emotional processing (Bush, Luu, & Posner, 2000). Moreover, it is involved in the generation of intention, and signals the command for execution to other brain areas, such as the DLPFC (Luu, Tucker, & Derryberry, 1998). It is this signal for behavioral intentions to which we now turn.

In electroencephalographic (EEG) studies, activation of the monitoring system is associated with a component of the event-related potential (ERP) called the *error-related negativity* (ERN) (Falkenstein, Hohnsbein, Hoorman, & Blanke, 1990; Gehring, Goss, Coles, Meyer, & Donchin, 1993). The ERN is a negative voltage deflection in the ERP after an incorrect response in reaction time tasks. It originates in the ACC (Van Veen & Carter, 2002) and is said to reflect the affective reaction to discrepancies between the actual and the correct response. Therefore, we can describe the ERN as the signal for behavioral control sent by the monitoring system to the operating system. Interestingly, ERN amplitude decreases when people's ability to self-control is reduced. In a study investigating the neural processes involved in self-control failure, Inzlicht and Gutsell (2007) found that after people engaged in self-control in an initial task, their ERN amplitude was decreased in a subsequent self-control reaction-time task. Interestingly, this decrease in ERN amplitude was correlated with, and in fact mediated by, subsequent decreases in task performance on a Stroop task (Inzlicht & Gutsell, 2007).

These findings suggest that a state of reduced self-control ability is associated with reduced affective reactions to one's own errors. Could it be that people stopped caring about their bad performance? Did they fail the subsequent self-control task because they did not feel the "pain" of failure? The results of this one study (Inzlicht & Gutsell, 2007) and that of others (e.g., Gutsell & Inzlicht, 2012a; Moser, Most, & Simons, 2010) suggests yes. Emotions are indeed an essential part of self-control. In terms of maintaining sustainable behavior, this indicates the following: even if we have a clear environmental goal and even if we realize that going to a fast food chain after a stressful day is not in line with our goal, as long as we do not feel strongly about the goal and feel the pain induced by deviating from it, we will not have the energy to overcome our urge to have a yummy burger.

In the remainder of the chapter we propose that pro-environmental issues are not emotionally charged enough to motivate people to act in a sustainable way. We need salient goals and powerful motivation to engage in self-control, but when it comes to abstract environmental goals, people often lack one essential component of self-control—emotion.

STRONG MORAL INTUITIONS PROVIDE THE EMOTIONS TO FUEL SELF-CONTROL

People's strongest values are their moral values. Moral values predict intentions to act and actual behavior (Schwartz, 1977), and they do so better than mere attitudes without the moral connotation (Godin, Conner, & Sheeran, 2005). The reason for this superiority seems to lie in the strengths of the emotional reactions elicited by violations of moral values.

The rationalist tradition, evolved from theorists such as Kohlberg (1969), Piaget (1932), and Turiel (1983), emphasizes the role of deliberate cognitive processes; when people decide how one should act in a certain situation, they reach the solution primarily by a process of reasoning and reflection (Haidt, 2001). Recently the rationalist model has been challenged by the idea that our moral decisions result from strong emotional reactions to the moral subject in question. When people make decisions that concern their moral values, they get very emotional and feel strong implicit tendencies to act according to their values. These moral intuitions (Haidt, 2001) guide moral behavior in an automatic and effortless way.

Indeed, moral intuitions often express themselves through strong affective reactions—something that is generally called a gut feeling—and people often use their gut feelings as a source of information when they make decisions (Batson et al., 2007; Haidt, 2007). For example, when people receive false feedback on how strong their body's psychophysiological reaction to certain moral issues are, they later give more priority to the moral issue that they thought their body reacted to the most (Haidt, 2001). Thus, the participants relied on their body's psychophysiological reactions—their gut feelings—to judge moral issues. Moreover, using fMRI, Greene, Sommerville, Nystrom, Darley, and Cohen (2001) showed that when people are confronted with moral dilemmas in which the rationally correct response would be to act against strong intuitive emotional response tendencies, they have a harder time solving the dilemma as indicated by longer response times. For example, when Greene and colleagues' participants judged a personal dilemma—for example, whether it would be OK to push a person in front of a trolley in order to save the lives of five other people—they were less likely to agree than when they would merely have to press a button that would direct the trolley to another track where it would kill one person instead of five—a more impersonal dilemma. Interestingly, the only differences in brain activity for the personal and the impersonal dilemmas were found in the medial frontal gyrus, the angular gyrus, and the posterior cingulate gyrus—all areas previously associated with emotional processing (Harenski, Antonenko, Shane, & Kiehl, 2010). Moreover, those few who actually decided that pushing the person was appropriate took much longer to respond, possibly indicating interference of the strong emotional response with the deliberate, rational judgment. Therefore, the degree to which a moral issue engages our emotions determines the strength of our moral intuitions and the ease of those decisions.

The implication is that strong moral values elicit strong emotional reactions when violated. This makes moral values potential powerful motivators for sustainable behavior. If sustainability became a moral issue, people should feel these strong emotional reactions whenever they engage in nonsustainable behavior, motivating them to change their behavior and to take action.

Because of the strong influence that emotions have on our moral decisions, moral values that elicit very strong emotional reactions when violated can be almost inviolable—the individual feels so strongly about these values that a violation would cause a sudden very strong feeling of repulsion just by the thought of such a violation. People are extremely reluctant to make trade-offs when such "sacred" values are at stake (Tanner, 2009). In other words, they do not apply the same criteria of costs versus benefits to their most sacred moral values.

Research on prejudice reduction has shown that people for whom egalitarian values are self-determined, internalized, and sacred, and for whom these values have strong personal significance, can automatically suppress prejudice (Legault, Green-Demers, & Eadie, 2009). Thus it seems that strong, emotionally charged, moral values—our sacred values—have the capacity to automate our behavior, thereby making willful control of moral behavior unnecessary. In the same way, strong, emotionally charged, pro-sustainability values could facilitate sustainable behavior by automating it, thereby circumventing the necessity of constant, active behavioral control.

Providing people with strong moral values that have the potential to elicit strong emotional reactions when violated could boost people's capability to self-control in three important ways. First, having pro-environmental moral values would make behavioral goals, such as recycling, salient and easily accessible and would therefore facilitate monitoring the progress in goal attainment. Second, strong moral intuitions associated with pro-environmental values would elicit a strong affective reaction to any failure to act according to these values—most likely associated with an increased activity in the ACC, therefore providing a strong signal for behavioral change to the prefrontal operating system. Finally, moral pro-environmental values might even be central and important enough for the person to automate sustainable behavior and thus might facilitate the operating process in self-control. Once sustainable behavior becomes automatic, effortful self-control would be unnecessary, thereby saving people's self-control resources.

PROMOTING THE "RIGHT KIND" OF MORAL VALUES

How strongly we feel about an issue depends to a large degree on why we think it is important. We know that strong emotional reactions are necessary for good self-control, and strong moral values can elicit such strong emotional reactions when violated. The question now is whether all types of moral values are equally well suited to motivate sustainable behavior.

Research on morality has long been almost exclusively focused on two important moral domains. The first is empathy-related moral concern, where the central criterion to discern right from wrong is whether another person or entity gets hurt—people care for the environment because they feel with and for the plants, animals, and people. The second is fairness-related moral concern, which is primarily concerned with whether or not someone is treated fairly—people care for the environment because it's not fair to future generations to destroy natural resources (Haidt & Graham, 2007).

According to Haidt and Graham's (2007) five-foundation model of morality, the empathy-related domain (harm/care) evolved from our natural instinct to protect and nurture our children and relatives. It is based on altruism and our capacity to feel the emotion of compassion. The fairness-related moral domain (fairness/justice) evolved from the need to have a functional community and is based on ideals of reciprocity and equal respect. Although harm/care and fairness/justice seem to have evolved based on distinct evolutionary selection pressures, they are both part of our social behavioral repertoire. When we decide to buy an environmentally friendly laundry detergent, we might do that because we do not want other people or animals to get hurt by toxins in the rivers and drinking water—a harm/care value. Alternatively, we might choose the detergent because we think it's not fair for future generations if we keep on destroying our natural resources—a fairness/justice value. In both cases it is about others; our behavior is driven by social concerns about protecting individuals (Haidt & Graham, 2007) and most likely depends on our social abilities.

Showing that the moral domains of harm/care and fairness/justice indeed rely on social abilities such as cognitive and emotional perspective taking and empathy, Robertson (2006) demonstrated that sensitivity to moral issues is associated with activity in many brain areas that are involved in social processing. While participants looked at pictures depicting harm/care-related and fairness/justice-related moral issues, the polar medial prefrontal cortex, the dorsal posterior cingulated cortex, and the posterior superior temporal sulcus where active—areas that, among other functions, have been previously related to cognitive and emotional perspective taking (Frith & Frith, 2001, Ruby & Decety, 2001), imitation (Chaminade, Meltzoff, & Decety, 2002), and monitoring of one's own and others' mental states (Frith & Frith, 2001). Thus, both harm/care and fairness/justice rely on people's ability to empathize with those affected by our moral decisions.

However, such a focus on a social morality that is based on empathy for individuals becomes problematic when the issue at hand is not about individuals, such as the destruction of pristine and remote natural environments, or if it concerns people who are very much distinct or unfamiliar to the person who makes the moral decision. Research on empathy suggests that empathy is limited to close others and those who are similar to us and are familiar to us (e.g., Gutsell & Inzlicht, 2010a). Thus harm/care and fairness/justice might be insufficient to motivate people when the problem at hand extends outside of this closed circle of close familiar and similar others.

THE LIMITATIONS OF THE HARM/CARE AND FAIRNESS/JUSTICE MORAL DOMAINS

The individual-focused morality in Western societies is based on psychological and biological systems that evolved from life in small groups. Our ability to empathize particularly well with those to whom we feel connected, therefore, may have been biologically hardwired through natural selection. According to the concept of inclusive fitness, empathy and prosocial behavior are determined by their contribution to reproductive success in ancestral environments (Hamilton, 1964). From an evolutionary perspective, it makes much more sense to help those who share our genes or who are phenotypically similar to us—a sign of genetic similarity (Hamilton, 1964). Moreover, it makes sense to help those who are part of our group and with whom we are familiar (Krebs, 1991). This selection pressure seems to have shaped us in such a way that our neural networks for empathy are specifically responsive to people to whom, for one reason or another, we feel a strong connection.

According to the action–perception model of empathy (Preston & de Waal, 2002), people understand others' emotions by simulating these emotions. When someone (the subject) observes another (the object) experiencing emotions, the object's body and facial expressions activate the subject's neural networks for the same expressions (Dimberg, Thunberg, & Elmehed, 2000). Expressing the emotion elicits the associated autonomic and somatic responses, which then generate the emotional experience (Decety & Jackson, 2004). Hence, the subject has access to the object's inner states because the mere perception activates the same neural networks in the subject. By adopting the object's inner states, the subject experiences these states and emotions firsthand and thus lays the foundation for empathy. This simulation in shared neural networks for action and perception is essential for all subsequent stages of empathy.

The system of neurons building these shared networks is called the *mirror neuron system* (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003) because during observation, this system "mirrors" the activation patterns that produce the action. This mirror system is a cortical network that consists of sensory motor areas in parts of the premotor cortex, the caudal part of the inferior frontal cortex, and the rostral part of the inferior parietal lobule (Decety & Lamm, 2007). However, this neural simulation mechanism extends to other areas of the brain depending on the specific nature of the mirrored stimulus. It is, thus, not limited to simple motor behavior but can pick up more abstract intentions and emotional states. Research using fMRI identified shared networks of observation and experience for disgust (Wicker, Keysers, Plailly, Royet, Gallese, & Rizzolatti, 2003), pain (Singer, Seymour, O'Doherty, Kaube, Dolan, & Frith, 2006), touch (Keysers, Wicker, Gazzola, Anton, Fogassi, & Gallese, 2004), and facial expressions (Carr et al., 2003). For example, the observation of someone in pain activates the somatosensory cortex, the anterior medial cingulated cortex, the cerebellum, and the anterior insula—areas also active when the observer experiences pain themselves (Singer et al., 2004). Thus, the perceiver "catches" the emotions and experiences of the object, and thereby automatically derives an intuitive understanding of the other. This process is automatic, without intention or conscious control. Yet our emotional networks are not triggered in every situation and for everyone.

From behavioral research we know that whether we empathize with someone or not depends on perceived similarity, familiarity (Wilson & Sober, 1998: 21), and affiliation with the target (Vignemont & Singer, 2006). Apes also empathize more with familiar apes who received electric shocks than with unfamiliar apes (Miller, Murphy, & Mirky, 1959). Moreover, in humans, emphatic concern for others is eliminated when one controls for "oneness"—the degree to which participants perceive themselves in the other (Cialdini, Brown, Lewis, Luce, & Neuberg, 1997). These biases seem to exist even on a neural level. Research on empathy for pain found that the observation of another person receiving painful stimuli activated the same networks as the experience of pain, but only when the observer liked the other person or was somehow affiliated with him or her (Singer et al., 2006; Xu, Zuo, Wang, & Han, 2009).

The neural simulation process is also constrained by our social categories and social attitudes. A recent fMRI study, for example, found that people show more neural activation in pain circuits when observing the painful penetration of the hands of ethnic in-group members than of out-group members (Xu, Zuo, Wang, & Han, 2009; see also Mathur, Harada, Lipke, & Chiao, 2010). Similarly, using transcranial magnetic simulation (TMS), Avenanti, Sirigu, & Aglioti (2010) found less corticospinal muscle inhibition when participants observed ethnic out-group members receiving painful stimuli than when observing the same thing happening to in-group members. Finally, using the electroencephalogram (EEG) to measure vicarious activations of motor cortex during observation of action, Gutsell and Inzlicht (2010) found that people simulate actions of ethnic out-group members less than those from ethnic in-group members and the degree of simulation decreases the more prejudiced people are toward out-groups. Based on these findings it seems that empathy is limited to close, familiar, and similar others and that the more distant the other is, the less empathy we feel.

WHERE DOES THAT LEAVE THE ENVIRONMENT?

If we do not intuitively catch the emotions of those who do not belong to our inner social circle, then we will have a harder time empathizing with them and, importantly, their suffering will not elicit the same strong emotional reactions that would the suffering of someone to whom we feel more connected. Therefore, because the individual-focused moral domains of harm/care and fairness/justice depend on those emotional reactions to others' suffering, they might be insufficient to elicit strong enough moral emotions to motivate sustainable behavior. Sustainable behavior often is targeted toward alleviating relatively abstract environmental problems. For example, when we recycle, we often do not see a direct relation to our own well-being or the well-being of close others. Most likely it is hard for people to relate to abstract constructs such as biodiversity or the climate. Although easier, it will also be problematic to relate to the millions suffering from the lack of natural resources in faraway countries, or to animal species people have never seen.

Generally, most people would agree that they care for the environment and probably most people have at least some goals that are related to a sustainable lifestyle, but for most people, the problems that sustainable behavior aims to alleviate are rather abstract. For example, more than 50% of the people in the United States agree with the statement that climate change is a very serious problem (United Nations Development Program, 2007). However, when asked what they worry most about when thinking about climate change, people were most concerned about the impact on people around the world and nature. Only a minority was actually concerned about the impacts on themselves, their families, and their communities. This might explain why people often do not act in a sustainable way to prevent climate change although they agree that it is a serious problem. When people do not see how climate change would affect them personally, or close others, their empathic brains might simply shut down leaving them without the necessary emotional "fuel" for self-control. Although they might have good intentions, those people will fall back into their old nonsustainable habits the minute being green becomes effortful and requires them to restrain their selfish impulses.

Given that environmental issues are likely excluded from our inner social circle and empathy toward entities of the environment does not come to us naturally, a possible solution could be to actively foster empathy for the environment. Cognitive perspective taking, for example, has been shown to increase interpersonal sensitivity and understanding (Galinsky & Moskowitz, 2000). It can also increase helping (Batson, Chang, & Orr, 2002) and foster self–other merging (Galinsky, Ku, & Wang, 2005)—the individual feels more connected and similar to another person or object. Research on environmentalism suggests that inducing empathy through cognitive perspective taking is indeed a potent technique for increasing environmental concern and promoting pro-environmental behavior (Berenguer, 2007; Schultz, 2000). For example, research participants who took the perspective of an animal or a tree being harmed by human activity allocated more funding to environmental projects as opposed to other prosocial causes (Berenguer, 2007). Interestingly, perspective taking seems to exert its beneficial effects on empathy not simply by making people care enough to compensate for their lack of empathy, but by targeting the very basis of empathy—the neural simulation process itself. In a recent study, Gutsell and Inzlicht (2012b) had participants either take the perspective of a person while writing about a day in this person's life or try to be as objective as possible and to avoid taking the perspective while writing. Participants who took the perspective later showed more motor neuron activity while watching videos of strangers performing simple actions. These findings suggest, that perspective taking can facilitate the mirroring process and could, therefore, be a powerful tool to increase empathy for the environment. However, perspective taking seems to have its limits: Although, participants in Berenguer's (2007) study did show more pro-environmental behavior after having taken the perspective of a harmed bird or harmed trees, perspective taking was less effective when the targets were trees. Thus, although empathy-related biases could be alleviated through interventions that foster perspective taking, it might be comparatively harder when plants or the nonliving environment are concerned. Particularly for very abstract environmental issues it might, thus, be necessary to take a different approach.

DISGUST—AN ALTERNATIVE FUEL FOR SUSTAINABLE BEHAVIOR

As described above, most researchers have seen and still see morality as essentially concerned with protecting individuals. Human morality, however, does not end with harm/care and justice/fairness. Haidt and Joseph (2004) proposed that there are actually five psychological systems or moral foundations that each evolved independently and provide every human with a preparedness that creates affective reactions to certain patterns in the social environment. Cultures build their individual sets of moral virtues and vices on these universal and fundamental moral foundations and thus in different cultures, each moral foundation might be differently pronounced.

The individual-based foundations of harm/care and fairness/justice are only two of these five foundations. In addition the model includes two group-based moral foundations: (1) in-group/ loyalty, which evolved from living in kin-based groups, is concerned with the welfare of the in-group and promotes virtues such as loyalty, patriotism, and conformity; and (2) authority/respect, which evolved from life in hierarchically structured in-groups, promotes virtues such as respect, duty, and obedience. Finally, the model includes purity/sanctity. In contrast to all four other domains, purity/sanctity did not evolve from selection pressures posed by life in small groups, but from food selection. When humans started to include meat in their diet at the same time as their brains started to grow rapidly, they developed the uniquely human emotions of disgust (Rozin, Haidt, & McCauley, 2000). Although disgust initially served to facilitate the oral rejection of harmful or distasteful substances (Rozin & Fallon, 1987), during our evolutionary history, it evolved to extend to social and moral domains. Consequently, disgust not only guides our food preferences but also shapes our moral values and judgments.

People report finding immoral acts disgusting (Rozin et al., 2000) and they punish people when they are disgusted by their unfair behavior (Chapman, Kim, Susskind, & Anderson, 2009). Due to their evolutionary origin, social and moral disgust still function very much like physical disgust. For example, immoral behavior elicits the typical facial disgust expression (Chapman et al., 2009) and the same neural structures are involved in the experience of physical and moral disgust (Moll et al., 2005). Research participants who read scenarios designed to evoke pure disgust versus moral disgust or indignation show similar activity in the lateral and medial orbitofrontal cortex, areas involved in diverse reward and food-related processing.

Because disgust—a powerful moral emotion—did not evolve from life in small groups, but from an entirely nonsocial domain, it likely is not restricted to our immediate social environment. Therefore, purity/sanctity—the moral foundation strongly associated with disgust—is likely a moral value that could include those abstract environmental issues that do not immediately concern other people or focus on nonliving concepts such as pristine mountain lakes or the climate.

Disgust evolved from the concern that objects are pure, clean, and not contaminated. When it evolved to a moral emotion, it seems to have maintained this focus on objects and extended to include abstract concepts. In many cultures, purity/sanctity and the related disgust support a set of virtues and vices that aim to keep the body clean and the soul pure. Common purity/sanctity concerns are about chastity and spirituality. One should not engage in carnal passions such as lust or gluttony, because that would taint the body and thereby taint the soul (Haidt & Joseph, 2005). These concerns work similarly with objects; most people would be horrified if someone would spit on a church floor or on a flag, because this physical taint is strongly associated with the taint of something spiritual and sacred. Disgust is a powerful motivator, and because it is not social in nature, it may not be limited by the same social boundaries as the individual-focused moral emotions, such as compassion and a sense of fairness. Therefore, by making the environment a sacred place, by giving it a soul that needs to be protected and kept pure, we may be able to create powerful motivations to protect the environment.

CONCLUSION

If people would start to treat nature as something sacred, as something that cannot simply be used, but must remain pure, people would feel a strong moral obligation to protect the environment. This moral obligation would lead to a pang of disgust whenever people would see or think about the destruction of our planet, and most importantly, this disgust might make people truly care about whether they act according to their pro-environmental beliefs. A person with the purity/sanctity moral value of "the earth is sacred and must not be destroyed" could adapt a behavioral goal such as "I will recycle." Should she fail to follow through with her intentions, throwing a whole pile of paper into the garbage because the recycling container is a few steps further down the street, she will literarily feel disgusted by her behavior and this strong emotion will make her go those extra few steps. When not recycling represents a violation of something sacred, engaging in sustainable behavior becomes easy and almost automatic, therefore saving cognitive rescores and making a sustainable lifestyle possible, even under stress or other constraints.

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