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Social Influence on "Self"-Control

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Abstract
As Duckworth and Kern (2011) note, currently over 1% of the abstracts in PsycInfo are indexed by "self-control" or one its synonyms. As part of this widespread interest, cognitive and neural scientists are debating the psychological mechanisms of self-control (Ainslie, 1975; Metcalfe & Mischel, 1999; Muraven & Baumeister, 2000), and the implementation of these mechanisms in the brain (Figner, et al., 2010; Hare, Camerer, & Rangel, 2009; Hare, Malmaud, & Rangel, 2011; Kable & Glimcher, 2007, 2010; McClure, Ericson, Laibson, Loewenstein, & Cohen, 2007; McClure, Laibson, Loewenstein, & Cohen, 2004). These efforts, however, currently proceed without much agreement on a theoretical or operational definition regarding what constitutes "self-control" (Duckworth & Kern, 2011). Definitions have been offered, of course, but one gets the sense that many investigators are content defining self-control in much the same manner that American courts define pornography - "I know it when I see it" (Jacobellis vs Ohio, 1964).

Just as our intuitions regarding physics can be mistaken, so too can our intuitions regarding psychology (Stanovich, 1985). This essay argues that an over-reliance on "intuitive psychics" is hindering efforts to identify the cognitive and neural processes involved in self-control. Specifically, current theories tend to underemphasize or ignore completely a factor of critical importance – the social world. Yet, "self-control" is a concept that only emerges at the level of the person in society: it is the social world that defines what is and is not a self-control problem. This realization has important implications for people interested in cognitive and neural mechanisms: it suggests that self-control is unlikely to be a single process; that the computation of social norms is an understudied process that is likely critical for self-controlled behavior; and that interventions that target the social context to increase the influence of norms may prove the strongest way to increase self-controlled behavior.

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Self-control at the Behavioral Level: A Descriptive List

What is "self-control"? We begin by looking at the answer to this question at a more holistic level, in terms of the specific behaviors people engage in that exemplify self-control or the lack of self-control. Ultimately, this essay is focused on the answer at a different level of analysis, that of the cognitive and neural mechanisms involved in self-control. However, it is easier to start by considering specific behaviors that exemplify self-control, a question on which there seems to be more agreement, before turning to the debate over what the underlying mechanisms of those behaviors are.

So, what behaviors get labeled "self-controlled"? Though in general we should have a healthy suspicion of our psychological intuitions as explanations, here those intuitions are the topic of study. That is, what does the concept of "self-control" refer to, as used in the natural language? Before considering the validity of intuitive or other explanations for what self-controlled acts share, it is necessary to know what the category of self-controlled acts is, as concretely as possible. The following examines how and when the term "self-control" is used to describe behavior, including the examples psychologists and neuroscientists use, as well as systematic investigation of the acts people nominate as representing self-control (Tsukuyama, Duckworth, & Kim, in press).

One category of acts that get called self-controlled involves avoiding vices. These vices include foods that are bad for you, cigarettes, alcohol, drugs, gambling, impulse buying, pornography,

and cheating on one's romantic partner. The dieter, teetotaler, and tightwad are held up as having good self-control (in some cases *too good*). Controlling one's anger might also be placed in this category, since it also involves avoiding an action that, at least in the short-term, feels pleasurable. Interestingly, most of the acts in this category often get couched in the language of addiction. So one might summarize this category by saying that, if you can "seek help" or go to rehab for it, it's a behavior that someone has ascribed to a lack of self-control.

A second category of acts that get labeled self-controlled involves hard work – grit, persistence, effort, etc. This includes exercising to stay fit, practicing to master a new skill, studying to do well in school, and completing one's jobs at work. The A-student, the worker who meets deadlines, and the athlete who puts in long hours at the gym are held up as having good self-control. By contrast, procrastination and laziness are ascribed to a lack of self-control. Rather than avoiding an action that in the short-term feels pleasurable, these behaviors involve persisting in an action that in the short-term feels painful. Already, this suggests a broad division between acts of self-control that involve reigning in approach tendencies and acts of self-control that involve reigning in avoidance tendencies.

There are other behaviors that get ascribed to a lack of self-control that do not fit neatly into one of these two broad categories. These include criminal behavior, dishonest behavior such as lying, and socially inappropriate behavior such as speaking without thinking or being overly revealing.

Self-control at the Mechanistic Level: Three Prominent Accounts and Their Weaknesses

This list of concrete, observable behaviors serves as the target for potential explanations of self-control at the level of cognitive and neural processes. Several accounts have been proposed, each seeking to explain the commonality across all of the self-controlled behaviors in this list. The term "self-control" implies that there is something being controlled and something doing the controlling. Most mechanistic accounts follow this implication, positing a process that implements control and a process that requires controlling.

In this respect, it is important to note that we can be mislead by the implications bundled into the term itself. The three prominent accounts discussed below are all framed as competing systems – one a controller and one a controlee. But nothing about the self-control dilemmas these accounts seek to explain necessitates an assumption of competing systems or processes. All self-control dilemmas necessarily entail is a conflict between two *actions* – eating dessert or sticking to your diet, procrastinating or studying, breaking the law or following it. A theory of self-control only needs to explain the source and essence of this conflict. This conflict could arise from competing processes, but it need not do so.[1]

There are three prominent accounts of the conflict inherent in self-control dilemmas. While each pinpoints important insights, all three have significant flaws as a complete mechanistic explanation. Further, these accounts also fall short of characterizing the necessary and sufficient conditions for an act of self-control.

[1] As one example, Joe McGuire and I (2011) have proposed an explanation for failures to persist in delay-of-gratification that does not involve competing systems. Rather, there is only a growing conflict as one waits between the value of continued waiting and value of abandoning the delayed reward.

A first account characterizes the self-control conflict as requiring the inhibition of automatic responses to achieve one's goals (or equivalently, the inhibition of "dominant responses," "urges," "desires," or "impulses") (for example, Muraven & Baumeister, 2000). This description nicely captures that there must be an inclination to engage in the activity that is being avoided. We do not typically call someone who avoids drinking alcohol because they don't like the taste self-controlled.

However, while the inhibition of an automatic response could be a necessary condition, it is not sufficient for an act to qualify as "self-control". When someone leaves the house Saturday morning to drive to the store, and successfully catches themselves before driving on autopilot to work, they are certainly inhibiting an automatic response, but this seems quite far from the prototypical self-controlled behaviors listed above. Behaviors like this one have been widely studied under the rubric of "cognitive control" (for example, Miller & Cohen, 2001), a concept that seems to be overlapping with but not identical to self-control.

There is a bigger issue with this inhibition account, though. What does the inhibiting? Often, the inhibiting force is called "controlled cognition," the "will," or the "self." As many scholars have noted, these terms seems an awful lot like homunculi (Kurzban, 2010; Wegner, 2002). Although homunculi can have a role in psychological theorizing, that role is to "stand-in" for a process or mechanism that we do not yet understand (Attneave, 1960; Baddeley, 2001). A homunculus is a placeholder for a theory, not a theory in itself.

A second description of self-control dilemmas focuses on the timecourse of costs and benefits, and locates the conflict between immediate and delayed considerations (for example, Ainslie, 1975).[2] The addict chooses an immediate reward, the high of drugs, over a larger delayed reward, better long-term health. The procrastinator avoids an immediate pain, the drudgery of work, but incurs a larger delayed pain, the costs of failing to complete that work. In contrast, self-controlled behaviors usually involve choosing a long-term gain at the expense of a short-term pain. This account nicely captures the fact that most self-controlled acts have a similar timecourse of costs and benefits.

However, while conflict between the short and long-term is a frequent characteristic of self-control dilemmas, patience alone (i.e., choosing delayed over immediate rewards) does not seem to be the essence of self-control. In many cases, choosing immediate outcomes at the expense of delayed ones is not seen as a failure of self-control. For instance, we do not begrudge the lottery winner who buys their parents a new house rather than invests all of their winnings, nor do we criticize the aging retiree who moves their accounts into cash and bonds. Correspondingly, acting in one's long term interests is not always attributed to self-control. For example, consider the small businessperson who sells you an initial product at a loss to gain you as a customer, or the bird who hides away seeds and comes back to eat them months later.

[2] This conflict is often described as one between a system that values only immediate outcomes and a system that is more future-oriented (McClure, et al., 2007; McClure, et al., 2004). But, as I have argued elsewhere (Kable & Glimcher, 2007, 2010), this need not be the case. Both the behavioral and neural evidence is consistent with a single system that evaluates both immediate and delayed outcomes. The conflict arises, then, when that system evaluates two actions as being quite close in overall value, despite having different temporal profiles.

There is also a further issue with the impatience account, which is that only some immediately available outcomes are associated with self-control problems, while others are not. When I walk through the corner market, I may be "tempted" by the chocolate ice cream but not by the vanilla right next to it, despite both being available immediately. One of the important findings of Mischel's delay-of-gratification experiments was that performance was not determined by immediacy *per se*. The marshmallow hidden under a bowl was easier to resist that than the one in plain sight, despite the fact that both were available with the same immediacy (Mischel, Shoda, & Rodriguez, 1989).

A third explanation situates the self-control conflict as one between "hot" emotional processes and "cool" cognitive ones (for example, Metcalfe & Mischel, 1999). Here self-control involves the recruitment of cognitive processes to blunt the influence of emotional cues on behavior. This account nicely points attention towards the aspect of "temptation" missed by purely time-based accounts.

However, the "hot" system metaphor seems better suited for approach dilemmas, where a positive emotion motivates you towards an activity you would like to avoid, than for avoidance dilemmas, where a negative emotion motivates you away from an activity you would like to engage in. For someone exercising or studying or practicing, quitting that activity does not seem like a particularly "hot" option. Often, cognitive rationalizations – "I'll run tomorrow instead" – are a more salient feature.

There are also a few larger theoretical issues with the "hot" versus "cool" systems account. One issue is that this account relies on a distinction between cognition and emotion that many scholars argue cannot be cleanly drawn (Lindquist, Wager, Kober, Bliss-Moreau, & Barrett, in press). In addition, this account seems to elide any role for emotions in adaptive decision-making, despite several strong theoretical arguments that emotions function to improve decisions (Cosmides & Tooby, 2000; Damasio, 1994). In the specific context of self-control, this account seems to ignore a whole host of "hot" emotions – shame, embarrassment, guilt, pride – that more likely act to promote self-control than to thwart it.[3]

What All of These Accounts Miss: The Social World

This last point provides a critical clue about what is missing in all three of these process-level accounts. Shame, embarrassment, guilt and pride have been called the "social" emotions, because they function to promote socially appropriate behavior, behavior in line with social or cultural standards (Adolphs, 2003). It is the existence of such a social or cultural standard, which behavior lacking self-control violates, that is deemphasized or ignored in the above process-level accounts. In fact, the essence of the conflict in self-control dilemmas may be between what you *want* to do (that is, what you have an inclination or impulse to do) and what you *should* do – or, at least, *what other people think you should do*.

[3] These points all argue that the "hot" system construct is too broad. Most of what it seeks to explain, however, seems well captured by the narrower construct of "Pavlovian" processes, as described for example by Dayan and colleagues (Dayan, Niv, Seymour, & Daw, 2006).

A couple of examples illustrate the necessary role that social norms play in what gets labeled self-controlled behavior. Consider a Japanese Samurai in the middle ages, who commits *seppuku* (a type of ritual suicide) because of shame he has brought onto himself. While in many cases suicide is considered impulsive, I think seppuku would in contrast be considered self-controlled. The act is premeditated, occurs in a ritualized public performance, and is considered (in that time and place) honorable. There is no clear cognition-emotion conflict, since emotions such as fear and shame factor on both sides, and there is no conflict between the short- and long-term, since clearly the action is costly in both. What is shared with other self-controlled actions, though, is that despite a strong inclination to do otherwise, the actor follows through on the behavior required by his cultural norms.

Seppuku may be a heavy-handed example. Consider a light-hearted one, contained in a personal anecdote. When my daughter was around eighteen months old, we would reenact the same situation every evening. We would come home and enter the kitchen. There would be a bowl of water put out for our cats, and if I did not remember quickly enough to move the bowl out of reach, my daughter would walk over and dump the water – usually soaking herself as well as the floor. After this had happened probably a dozen times, I pleaded, "Why is the cat's water so *tempting*?!?" Notice the implicit inference, couched in the language of temptation and self-control. Could my daughter have had an irresistible impulse to turn over water bowls? Perhaps, though that seems a little silly. Was there a long-term cost to such behavior? Not really. But she was engaging in behavior that I, at least, had deemed inappropriate, and when she did not respond to me telling her so my first linguistic impulse was to blame this on a lack of self-control.[4]

The place of social norms in defining what is self-controlled explains that third, uncategorized group of behaviors listed above. What do committing a crime, lying, and speaking inappropriately all share with each other and with the other behaviors listed? The foremost thing these behaviors share is that they violate social norms and standards.

In addition, the necessary role of social standards in delineating what is self-controlled helps to explain an interesting fact about self-control – that we are reluctant to attribute it to other animals. For neurobiologists, the idea that self-control is unique to human beings is very puzzling if self-control is simply choosing patiently or overriding automatic behaviors. Other animals also plan and sacrifice for the distant future, such as the scrub jays that cache food based on their future (rather than present) needs (Clayton, Bussey, & Dickinson, 2003). Other animals also exhibit goal-directed behavior, behavior that is not simply "automatic" or "habitual" (Balleine & Dickinson, 1998). Yet such animal behaviors are not typically considered examples of "self-control." What these behaviors lack, though, is that they do not fall in line with a clear social or cultural standard. Although there is some evidence for culture in other primates (de Waal, 2001), there is still a large gulf in cultural sophistication and elaboration between humans and other animals. And it this gulf – that humans are steeped in social norms while other animals

[4] A similar kind of issue has been raised by Rachlin (2000) regarding Mischel's famous marshmallow test. He argues that the important motivation controlling delay behavior is not the desire for two marshmallows versus one, but rather the desire to comply with an adult's (implied) request to wait.

are not – likely explains why we attribute the capacity for self-control to humans and not other animals.[5]

Of course, previous work on self-control has not completely ignored the role of social standards. Consider for example, this recent definition:

"Self-control includes controlling thoughts, emotions, desires, and behavior, particularly so as to bring them in line with societal or personal standards such as moral rules, laws, ideals, social norms and prescriptive expectations (Gailliot & Baumeister, 2007, p 303)."

Societal or personal standards also had a prominent place in classic theories. Plato famously described the soul as a charioteer (reason) driving two winged horses, a "noble" one (our moral impulses) and one "quite opposite in breed" (our immoral appetites) (Plato, 1925). In turn, Freud described the conflict between the superego (our internalization of community standards) and the id (our impulses), which is arbitrated by the ego (Freud, 1927).

As exemplified by the three accounts above, though, more recent theorizing tends to deemphasize the role of social standards or social emotions. For another example, note how Camerer, Loewenstein and Prelec (2005), in their foundation paper arguing for neuroeconomics, subtly eliminate Plato's notion that some of our emotional impulses are noble:

"Plato described people as driving a chariot drawn by two horses, reason and passions (Camerer, et al., 2005, p 18)."

An earlier version of the paper contains a more dramatic mis-telling:

"The Platonic metaphor of the mind as a charioteer driving twin horses of reason and emotion is on the right track—except that cognition is a smart pony, and emotion a big elephant."[6]

This particular meme so captured the modern (*not* the Platonic) view of mind that it was repeated many times on the web and in print, from *The Economist* ("Mind games," 2005) to *Nature* (Lehrer, 2006).

This lack of emphasis on social influences in recent theorizing fits with several broad trends in psychology. The personality theorists that followed Freud increasingly pushed the "ego," and then the "self," to center stage. The cognitive revolution and the emergence of cognitive neuroscience, two milestone developments in the psychology, similarly focused attention on the individual mind independent of its social context. And many of the psychologists working on questions of self-control today are steeped in Western cultures biased to attribute behavior to the individual – and her personality, her character strengths – rather than the situation (Morris & Peng, 1994).

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[5] Interestingly, studies of temperament in animals have only found evidence for a dimension of conscientiousness—the dimension usually linked to self-control—in other apes (Gosling & John, 1999), and apes are the non-human animals for whom the evidence for culture is the strongest.

[6] This statement is corrected in the final version of the paper, though still in a way that deemphasizes Plato's notion that some emotions pull us towards "rational" behavior.

Implications for Cognitive and Neural Mechanisms: "Self-Control" is Not One Thing

That social norms are critical for defining what constitutes a self-control dilemma has important implications for cognitive scientists and neuroscientists studying self-control. First, if what makes the above list of self-controlled behaviors hang together as a category is that they involve behaving in accordance with a social standard, that makes it unlikely that these behaviors will all share the same deep structure at the level of cognitive and neural processes. Cultural norms can be overlaid on all kinds of different behavior, involving diverse underlying cognitive and neural processes. This means that self-control dilemmas are likely emergent phenomena – a category that arises at the level of the person in society, rather than a category arising because of shared structure in terms of psychological and neural processes. If this is the case, we should not be looking for a single "ability for self-control" or a single "neural mechanism of self-control."

In fact, at the psychological level, there is already a fair bit of evidence that there is not a single "ability for self-control." There are only very small correlations ($r \sim 0.1$) between different experimental measures of impulsivity and cognitive control (Duckworth & Kern, 2011). And, while the correlation between self-reports in different domains of self-control is higher (median $r \sim 0.3$), it is still at levels that suggest clear domain-specificity (Tsukuyama, et al., in press, see also Frederick, Loewenstein, & O'Donoghue, 2002). Compared to the domain of intelligence, where theorists still debate whether there are single or multiple factors, the evidence for a single factor of self-control is quite weak.

Implications for Cognitive and Neural Mechanisms: A Neural Mechanism for Computing Social Norms?

Recognizing the importance of social context also has important implications for neuroscientists studying self-control. It suggests that an important process involved in self-controlled behavior is the computation of what the appropriate social norm is, and the subsequent influence that this has on decision making. Neuroscientists have paid relatively little attention to this important topic (though see for example, Montague & Lohrenz, 2007). One speculation, consistent with a couple of different lines of evidence, is that the computation of socials norms is the critical function that prefrontal cortex plays in self-controlled behaviors.

Both theoretical and empirical evidence suggests that prefrontal cortex is critical for self-controlled behavior. Prefrontal cortex is one of the last regions to reach mature levels of myelination during development (Gogtay, et al., 2004), at an age (roughly the mid- to late-twenties) that most people would argue is accompanied by greater self-control. Impulsivity is also one of the more pronounced effects of lesions to prefrontal cortex (Bechara, Damasio, Damasio, & Anderson, 1994; Eslinger & Damasio, 1985), and both functional imaging and neural stimulation studies implicate prefrontal cortex in self-controlled behavior (Figner, et al., 2010; Hare, et al., 2009).

Most often, the role of prefrontal cortex in self-control is characterized as directly inhibiting prepotent responses. The 'direct inhibition' hypothesis, however, overlooks that psychologically direct inhibition is a poor route to self-control. Response inhibition alone does not lead to longer wait times in the delay of gratification tasks (Mischel, et al., 1989), response suppression is a less

effective method of emotion regulation (Goldin, McRae, Ramel, & Gross, 2008), and inhibition backfires during thought suppression (Wegner, Schneider, Carter, & White, 1987). In contrast, re-framing the situation both aids delay of gratification and succeeds as a method of emotion regulation (Goldin, et al., 2008; Mischel, et al., 1989). Reappraisal is also a closer psychological analog to how neuroscientists think about prefrontal function. Rather than *targeted inhibition*, neuroscientific theories of prefrontal cortex focus on *biased competition*: by actively representing information such as goals and rules, prefrontal cortex biases the flow of activity in other regions so that actions are sensitive to the behavioral context (Miller & Cohen, 2001). Jonathan Cohen provides an instructive example in some of his public talks. When you hear a phone ring, your natural inclination is to answer it, but this is inappropriate when the phone is not yours. Prefrontal cortex is hypothesized to represent the context (the phone is yours/not yours), and this representation is hypothesized to affect the flow of activity in other regions accordingly.[7]

Notice how the social context is right there in this paradigmatic example: answering someone else's phone would be socially inappropriate. But how does this neural representation of social norms come to be learned, and what triggers its activation in different contexts? We know very little about this, because social context has not been emphasized in neural studies. Rather, most studies of prefrontal cortex have stressed its role in encoding task goals or task rules. But this is in the laboratory, where an artificial task is set before the subject. "In the wild," social norms (for example, that it is not appropriate to answer someone else's phone) are probably the most important context-setters, and yet little attention has been paid to the possibility that prefrontal cortex computes social norms.

This hypothesis, that a critical function of prefrontal cortex is to encode the social context and adjust behavior accordingly, fits with several prominent theories regarding cortical evolution. Relative to other animals, humans have a proportionally larger cortex, and much of this increase in cortical size is in prefrontal cortex. What environmental challenge drove this increase in cortical size, despite the high metabolic cost of cortical tissue? One hypothesis is that the critical environmental challenge was *other humans*. Dunbar (2003) argues the drive for cortical enlargement came from competition and cooperation between individuals, and the associated need to recognize and represent the minds of many different individuals in order to predict their behavior. He points to the fact that, across the primate order, the proportional size of cortex is correlated with the size of the social group, with humans topping the primate species with an average group size of around 150 individuals. Boyd and Richerson (2005) make a similar argument at the group level, that the key driver of cortical evolution was the benefit to groups of humans of having the ability to learn and transmit cultural knowledge and cultural norms. Both hypotheses suggest that all of that additional tissue in prefrontal cortex in humans likely serves an important *social* function.

[7] Etienne Koehlin uses a similar example as well. Miller and Cohen (2001) use the example of an American tourist in England overriding their first instinct to look left at a crosswalk – here again note that a social/cultural rule sets the context.

Practical Implications: Self-Control Interventions

The role of social context in self-control also has important practical implications. Much effort, including millions of dollars of research funding, goes into designing interventions to strengthen self-control.[8] These interventions tend to focus on the individual: trying to strengthen their "self-control muscle", motivate them to pursue delayed rewards, or train them in cognitive skills and strategies. Less emphasis is placed on trying to influence self-control by strengthening the impact of norms through structural or environmental manipulations.

Yet norms do work. In many situations, simply informing people of the descriptive norm (i.e., this is what most people do) can dramatically alter their behavior (Cialdini & Goldstein, 2004). The success of programs like Weight Watchers or Alcoholics Anonymous in part traces back to creating a community to which one is accountable – successes and failures are now public. Further, anthropological research demonstrates how cultural norms impact problems around alcohol consumption (Gladwell, 2010). There are overall greater levels of alcohol consumption in several cultures compared to the United States, yet unlike in American culture, the presence of strong cultural norms around exactly how and when drinking occurs seems to prevent alcohol abuse.

Even if interventions do not directly target the social context, thinking about the applicable norms is critical. Efforts to reduce aggression will be less effective if they ignore the critical function that an aggressive response to a social challenge serves in some cultures. Similarly, efforts to reduce risky or impulsive behavior in adolescents often ignore that, for the adolescent, *there may be no self-control dilemma*. From the adolescent's perspective, the more important norm is the one of their *peers*, and their peers may *expect* risky behavior.

Conclusion

This essay began with the observation that self-control is defined a lot like pornography, in that, "I know it when I see it." There is something more to this analogy. Just like what is "pornographic" depends on the mores of the community, what is "self-controlled" depends on what is socially appropriate given the behavioral context. Recognizing that self-control is a phenomenon that emerges at the socio-cultural level has important implications for cognitive and neural scientists studying self-control. This emergence makes it highly unlikely that self-control will turn out to be a single cognitive or neural process at the mechanistic level. It also means that a complete understanding of self-control at the process level will require an understanding of how humans compute social norms, and the mechanisms through which those norms affect behavior—a topic that, in neuroscience studies at least, has received scant attention.

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[8] For example, the NIH spent $1.7 billion on substance abuse research in FY 2011 (http://report.nih.gov/rcdc/).

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