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Self-Control and Aggression

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Abstract

Psychological science has largely neglected the role of self-control in studying aggression. Fortunately, the past half decade has witnessed a surge of research on this long-neglected topic, including two self-control-informed integrative theories of aggression. Robust experimental evidence demonstrates that self-control failures frequently predict aggression and, conversely, that bolstering self-control decreases aggression. Research on rumination also suggests that maladaptive anger regulation decreases self-control and, consequently, increases aggression. Advances from social-affective and cognitive neuroscience suggest that the neural mechanisms involved in emotion regulation and cognitive control mediate the relationship between deficient self-control and aggression.

Keywords

self-control, aggression, rumination, social neuroscience

> "That night in Ohio, that one impulsive night. Nothing's been normal since then. It taints your whole life."
>
> (Serial killer Jeffrey Dahmer, discussing the murder of his first victim; Berry-Dee, 2011, p. 127)

When people imagine an extremely aggressive person, they often think of someone who is cold-blooded, plans the details of an aggressive act far in advance, and never lets an emotion sway a decision to behave aggressively. Yet, as the quote from Jeffrey Dahmer illustrates, even the aggressive behavior of serial killers can arise from impulsive aggressive urges.

Nonetheless, as noted in an influential meta-analysis, "most theories of aggression largely ignore the role that self-regulation plays in aggressive behavior" (Bettencourt, Talley, Benjamin, & Valentine, 2006, p. 753). When aggressive urges become activated, self-control can help one respond in accord with personal or social standards that admonish aggression. Although criminology and sociology acknowledge the importance of self-control (Gottfredson & Hirschi, 1990), these related disciplines lack the experimental approach necessary to establish firm causal links. Poor self-control over aggressive urges is a widespread problem, and addressing this problem has practical and scientific value for clinical, forensic, organizational, social, personality, and developmental psychologists, as well as for neuroscientists.

We begin by presenting two self-control-informed theories of aggression—a term defined here as behavior intended to inflict harm toward a victim who is motivated to avoid the harm. Next, we review recent experimental research within psychology on the influence of self-control on aggression in response to instigation (i.e., reactive aggression). Then we examine angry rumination and the neural mechanisms underlying self-control. Finally, we consider future research directions.

Theoretical Models: Emphasis on Self-Control

I^3 theory (pronounced "I-cubed theory") is a newly developed meta-theory that provides an integrative framework for linking the scholarly literatures on self-control and aggression (Finkel et al., in press). I^3 theory suggests that three processes underlie aggression: instigation, impellance, and inhibition (the three *I*s). Instigation refers to exposure to discrete social dynamics with the potential victim that normatively triggers an urge to aggress (e.g., provocation). Impellance refers to dispositional or situational factors that psychologically prepare the individual to experience a strong urge to aggress when encountering specific instigators in specific contexts (e.g., trait aggressiveness). The most powerful aggressive urges arise when both instigation and impellance are strong. Finally, inhibition refers to dispositional or situational factors that increase the likelihood that people will override an aggressive urge (e.g., trait self-control). When the strength of inhibition

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exceeds the strength of the aggressive urge, people behave nonaggressively; when the reverse is true, they behave aggressively. The three processes interact, with aggression being most likely when instigation and impellance are strong and inhibition is weak (Fig. 1). Although inhibition also encompasses social control (e.g., physical restraint from a third party), most inhibitory factors involve self-control.

The growing emphasis on self-control within the context of aggression is also illustrated by recent research incorporating self-control theorizing into the influential *general aggression model* (GAM; DeWall, Anderson, & Bushman, 2011). The GAM provides two points of entry for self-control processes. The first is as either an individual difference or a situational input variable (e.g., dispositional self-control, visible police presence). The second is as an influence on appraisal and decision making, wherein self-control processes foster a thoughtful reevaluation of the instigating trigger, which produces a considered, typically nonaggressive, action.

Experimentally Decreasing Self-Control Increases Aggression; Experimentally Increasing Self-Control Decreases Aggression

Recent theoretical developments have sparked interest in experimental research to test two hypotheses regarding the effects of self-control on aggression. First, the *depletion*

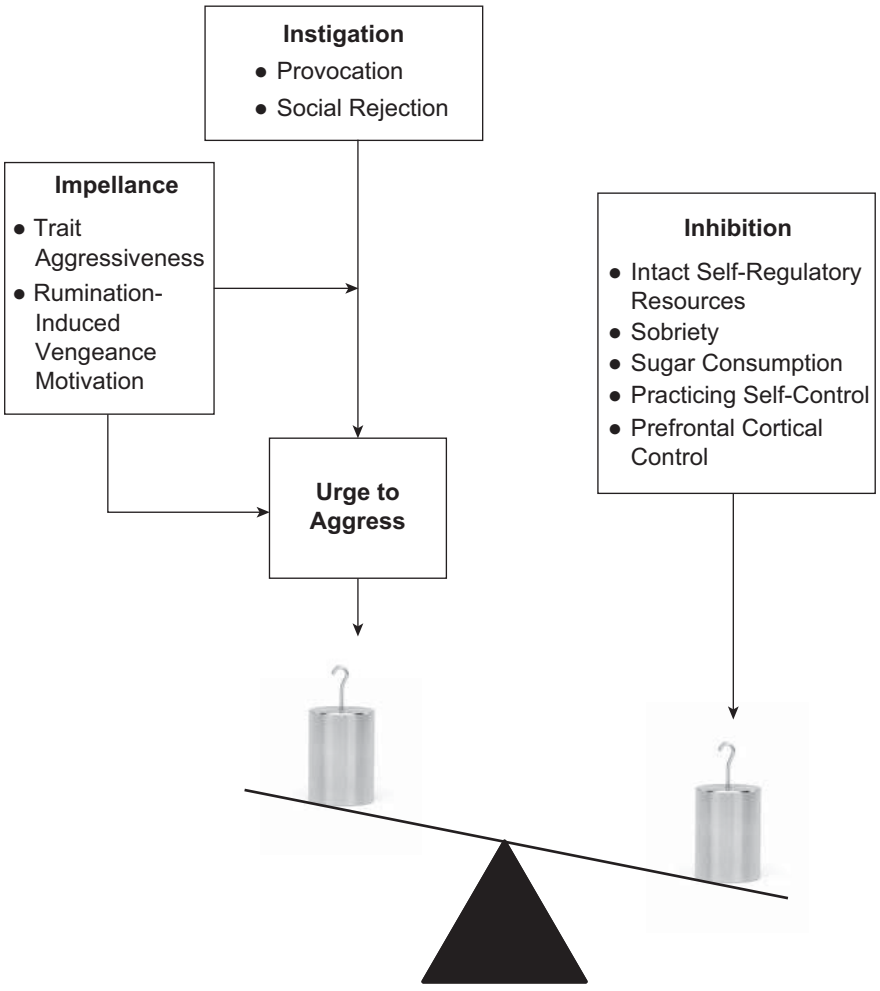

Fig. 1. Graphical representation of I^3 theory. Instigation involves social processes that normatively trigger an aggressive urge, and impellance characterizes the potentially aggressive person's "urge readiness" at the moment of encountering the instigation. Instigation and impellance combine additively and interactively to predict the strength of the person's aggressive urge. Inhibition characterizes the strength of the person's tendency to override this urge. The specific variables listed in the instigation, impellance, and inhibition boxes represent illustrative risk factors that predominantly promote aggression through that process (e.g., trait aggressiveness through impellance). When aggressive urges are stronger than inhibition, the balance tips in favor of aggressive behavior. In contrast, when aggressive urges are weaker than inhibition (as in the case illustrated in the figure), the balance tips in favor of nonaggressive behavior.

hypothesis is that a state of reduced self-control will increase reactive aggression. Self-control capacity relies on a limited resource that can become temporary depleted (Baumeister, Vohs, & Tice, 2007). Provoked individuals behave more aggressively when they are depleted than when they are not (Denson, von Hippel, Kemp, & Teo, 2010; DeWall, Baumeister, Stillman, & Gailliot, 2007). These results suggest that temporary reductions in self-control make it difficult to override aggressive urges. The findings are robust across diverse aggression measures including aversive noise blasts, hot sauce served to a confederate who dislikes spicy food, and damaging evaluations for a coveted research assistantship.

Do such findings generalize to aggression toward intimate partners? A recent investigation suggests that it does (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009). Participants who were ostensibly provoked by their partners with nasty feedback assigned their partners to hold painful body poses for substantially longer when they were depleted than when they were not depleted (Fig. 2). Thus, temporary reductions in self-control increase aggression toward both strangers and intimate partners.

Second, the *bolstering hypothesis* is that increasing self-control reduces aggression. One way to increase self-control involves practicing it over time. In one experiment, participants completed a measure of trait aggressiveness and were asked to use their nondominant hand for everyday tasks for the next 2 weeks (self-control-training condition) or answer math problems (control condition; Denson, Capper, Oaten, Friese, & Schofield, 2011). Subsequently, participants were provoked in the laboratory and given the opportunity to retaliate by administering aversive noise blasts. Participants who practiced self-control, compared to those who did not, reported decreased anger when subsequently provoked by a fictitious fellow student. Practicing self-control reduced retaliation among those high in trait aggressiveness.

Two weeks of self-control training also reduces aggressive tendencies toward intimate partners (Finkel et al., 2009). Both before and after the training, participants were depleted and reported how physically aggressive they would be if provoked by their partners in a series of scenarios (e.g., "My partner ridicules or makes fun of me"). Completing self-control training reduced aggressive tendencies from before to after the training regimen, whereas participants in a control condition did not change over time.

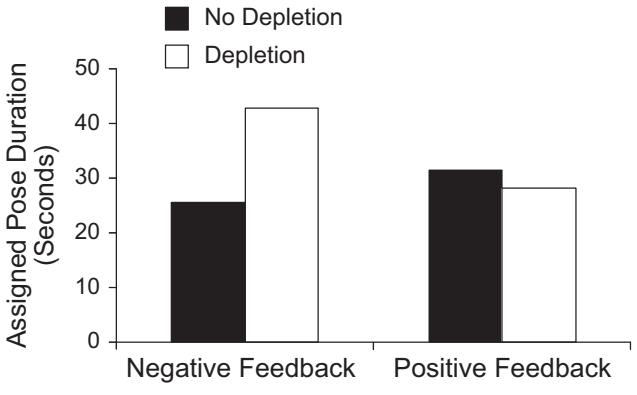

Fig. 2. Aggression toward romantic partners as a function of interaction between provocation and self-control depletion. Depleted participants assigned their partners to hold a painful yoga pose for a longer duration than did nondepleted participants, but only when they had been provoked (i.e., only when they were likely to be experiencing an aggressive urge).

Another method of bolstering self-control is via acute sugar consumption (Gailliot et al., 2007). Consuming sugar can improve performance on measures of working memory and executive functions (Gailliot et al., 2007; Smith, Riby, van Eekelen, & Foster, 2011). Two studies tested the hypothesis that consuming sugar would reduce aggression toward strangers (Denson et al., 2010). Participants drank either a sugary beverage or an equally sweet-tasting placebo beverage that lacked sugar. In the first experiment, participants were depleted (or not), provoked, and then were given the opportunity retaliate with noise blasts. Relative to placebo, sugar reduced aggression among participants who were prone toward the strongest aggressive urges (i.e., those high in trait aggressiveness). A second experiment found that consuming sugar reduced aggression among participants high in trait aggressiveness only under conditions of provocation.

In sum, provoked individuals behave more aggressively toward strangers and romantic partners when their self-Control has been depleted. Conversely, provoked individuals behave less aggressively when their self-control has been bolstered either through a training regimen or sugar consumption.

Emotion Regulation Gone Awry: Angry Rumination Reduces Self-Control and Increases Aggression

The research reviewed so far suggests that provoked individuals overcome aggressive urges more effectively when they are not depleted than when they are depleted. Indeed, healthy individuals report experiencing anger several times per week to several times per day, but they usually do not act upon it (Averill, 1983). Thus, when not depleted, individuals are often quite capable of regulating anger and controlling aggressive urges. But some forms of anger regulation require more effort than others. For instance, reevaluating an anger-inducing event prior to a full-blown anger response involves less exertion than regulating anger after experiencing it (cf. Gross, 2001). Angry rumination consists of re-experiencing the provocation, focusing on angry thoughts and feelings, and planning revenge; it increases anger, aggression, blood pressure, and aggressive cognition (Denson, 2009).

Denson (2009) proposed that because of the aversive and intrusive nature of rumination, individuals are typically motivated to stop ruminating. Doing so is challenging, however, because individuals must down-regulate the intensity of their anger experience, suppress angry thoughts, and refrain from acting on aggressive urges. All three processes require effortful self-control (Baumeister et al., 2007).

Four experiments tested the hypothesis that rumination in the aftermath of a provocation depletes self-control and increases aggression (Denson, Pedersen, Friese, Hahm, & Roberts, 2011). This hypothesis was confirmed regardless of whether rumination was manipulated or measured at the trait level. Moreover, consuming a sugary beverage improved performance on a measure of inhibitory control following rumination. In sum, rumination following a provocation increases aggression, and bolstering self-control can reduce this risk.

Neural Mechanisms of Self-Control and Aggression

Overriding aggressive urges begins in the brain. Identifying the relevant neural processes may inform our understanding of how to reduce aggression. Neuroscientific perspectives suggest that prefrontal cortical regions support control over anger and aggressive urges (Denson, 2011; Raine, 2008). Specific regions implicated include the orbitofrontal cortex, anterior cingulate cortex, medial prefrontal cortex (PFC), and dorsal and ventral lateral PFC. These regions broadly support self-regulatory processes, including emotion regulation (Heatherton & Wagner, 2011). Deficits or abnormalities in the function and structure of these regions predict violent behavior (Raine, 2008).

Heatherton and Wagner's (2011) cognitive neuroscience model of self-regulation suggests that self-control failure occurs when strong impulses overwhelm prefrontal control mechanisms. Thus, aggressive urges are especially likely to cause aggressive behavior when inhibiting influences—in the form of prefrontal cortical control—are weak. Factors that increase the likelihood of self-control failure include depleted self-control strength and alcohol intoxication (Finkel & Eckhardt, in press).

Such an account meshes well with I^3 theory and neuroimaging data. For instance, in a functional magnetic resonance imaging study, healthy undergraduates completed measures of trait aggressiveness in the laboratory and returned for a brain imaging session 2 weeks later (Denson, Pedersen, Ronquillo, & Nandy, 2009). In the first part of the imaging session, participants were insulted by the experimenter. Relative to a resting baseline, provocation increased activity in brain regions implicated in negative affect and arousal (e.g., the insula) and regions involved in cognitive control and emotion regulation (e.g., the dorsolateral PFC, medial PFC, dorsal anterior cingulate cortex). These findings illustrate the importance of the neural interplay between the urge to aggress and executive control in determining aggressive behavior. Furthermore, individuals high in trait aggressiveness showed pronounced activation in the dorsal anterior cingulate cortex in response to the provocation. The dorsal anterior cingulate cortex functions as a "neural alarm system" that recruits prefrontal cortical control. The amplified dorsal anterior cingulate cortex response suggests that participants high in trait aggressiveness recruited increased self-control resources in response to provocation.

In the second part of the imaging session, participants engaged in rumination and distraction in counterbalanced order. Relative to distraction, rumination increased activity in many of the same prefrontal and limbic regions activated by provocation. These results dovetail nicely with the behavioral evidence that post-provocation rumination reduces self-control and increases aggression. Specifically, recruitment of prefrontal regions during rumination may, partially via resource depletion, tip the balance toward acting upon aggressive urges.

Future Directions

The recent advances in theory and research we have reviewed suggest that self-control processes are crucial in determining whether people act upon versus override their aggressive urges. A rapidly growing body of experiments demonstrates that (a) temporary reductions in self-control increase aggression, (b) bolstering self-control reduces aggression, (c) rumination following a provocation reduces self-control and increases aggression, and (d) the recruitment of prefrontal cortical control is implicated in overriding aggressive urges.

The experiments on bolstering self-control foster optimism regarding the possibility of improving self-control as a means to reduce aggression. That is, if aggressive individuals control their behavior via self-control training or sugar consumption, they enact less aggression toward strangers and romantic partners (Denson, Capper, et al., 2011; Denson et al., 2010; Finkel et al., 2009). Randomized controlled trials are needed to test self-control-bolstering interventions in individuals with clinically significant impulsive aggression problems such as psychopaths. Psychopaths show abnormal functioning in neural regions underlying executive functioning and thus may benefit from bolstering self-control. Self-control training may be easier to implement in clinical situations than sugar consumption, as training using one's non-dominant hand (for example) could be incorporated into existing interventions; providing aggressive individuals with sugar prior to provocation may prove difficult. This work might also foster alternative cognitive mechanisms to rumination such as mindfulness training. Mindfulness is emerging as a promising means of decreasing rumination, which could thereby improve self-control.

Despite these advances, many questions await future inquiry. For instance, it remains unknown whether bolstering self-control capacity can improve control for individuals high in the implicit motivation to aggress. The research reviewed here assessed trait aggressiveness via explicit self-report. Prominent approaches to implicit aggressiveness have not yet considered self-control (James & LeBreton, 2010). We also have incomplete knowledge of the causal pathway through which prefrontal cortical regions support self-controlled behavior. Convergent evidence from genetics and neuroscience suggests that serotonin may play a critical role in determining when self-control influences aggression (Raine, 2008). Low levels of serotonin predict increased aggression, and experimental serotonin augmentation reduces aggression among those high in trait

aggressiveness. Thus, serotonin likely reduces aggression by improving effective emotion regulation and behavioral control, but firm conclusions await additional research.

Another future direction is to determine when self-control *increases* aggression rather than decreases it. Many premeditated acts of aggression or terrorism require exceptional self-control to resist the urge to retaliate immediately, to plan an attack years in advance, or to force oneself to enact brutal behaviors (a la Lady Macbeth's murder of King Duncan). For example, training military personnel to override inhibitions toward harming others presumably requires self-control. Indeed, when people make judgments to kill one person to save many people, activation increases in some of the neural regions implicated in self-control (e.g., Greene, Nystrom, Engell, Darley, & Cohen, 2004).

Conclusion

Aggression may have been an adaptive mechanism in our ancestral past. However, modern life requires effective control over anger-driven aggressive impulses. The present review suggests that experimental research on the psychological and neural mechanisms underlying self-control can eventually contribute to reducing the psychological, economic, physical, and social harm associated with uncontrolled aggression.

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