



## Expanding minds: Growth mindsets of self-regulation and the influences on effort and perseverance<sup>☆</sup>



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### ABSTRACT

Given that countless studies have documented the wide-ranging benefits of self-regulation, determining if and how self-regulation can be improved is an important scientific and societal priority. Existing theories suggest that the deterioration of self-regulation is partially shaped by perceptions of effort. Therefore, one promising way to sustain self-regulation may be to cultivate a growth mindset, which has been shown to affect behavior in part by altering effort attributions. Although growth mindsets—the belief that a given trait can be improved through practice—have been studied extensively, particularly in the domain of intelligence, little research has examined the effects of promoting a growth mindset specifically about self-regulation. Here five studies test how promoting a growth mindset of self-regulation impacts actual self-regulation in daily life and the laboratory. In Study 1, relative to an active control that received relationship training, an intensive self-regulation training program emphasizing a growth mindset led participants to persevere longer on impossible anagrams, which was partially mediated by altering attributions of mental fatigue. Relatively, the self-regulation training also led participants to notice more opportunities for self-control in daily life and more successfully resist everyday temptations. The subsequent four studies isolated and abbreviated the growth mindset manipulation, demonstrated improved persistence and decreased effort avoidance, and attempted to further examine the critical mediators. Collectively, results indicate that a growth mindset of self-regulation can change attributions and allocation of effort in meaningful ways that may affect the willingness to attempt challenging tasks and the perseverance required to complete them.

Extensive research indicates that self-regulation—the ability to direct one's attention, thoughts, moods, and behavior in line with one's personal goals—is among the most critical skills in life. High levels of self-regulation predict better academic achievement, greater professional success and income, stronger interpersonal relationships, more fulfillment, and better health (Baumeister, Heatherton, & Tice, 1994; Duckworth, 2011; Duckworth & Seligman, 2005; Mischel, Shoda, & Peake, 1988; Moffitt et al., 2011; Ridder, Ouwehand, Stok, & Aarts, 2011; Ryan & Deci, 2000; Shoda, Mischel, & Peake, 1990). Given that self-regulation underlies such a diversity of highly valued outcomes, it would be of great value to identify successful interventions that can allow individuals to effectively develop and exert such control.

An emerging consensus is forming that one powerful determinant of self-regulation is how an individual *experiences and interprets effort*

(Brehm & Self, 1989; Brehm, Wright, Solomon, Silka, & Greenberg, 1983; Eisenberger, 1992; Hockey, 2011; Inzlicht, Schmeichel, & Macrae, 2014; Kurzban, Duckworth, Kable, & Myers, 2013; Molden, Hui, & Schooler, 2016). Recent theories suggest that negative interpretations of accumulated effort can shift motivational priorities and lead individuals to withdraw effort even at the risk of self-regulatory failure (Boksem & Tops, 2008; Hockey, 2011; Robert & Hockey, 1997). As an illustration, one primary reason why autonomously chosen goals are often achieved appears to be because individuals interpret the exertion of effort toward those goals as natural and “having a sense of ease” (Deci & Ryan, 2012; Werner, Milyavskaya, Foxen-Craft, & Koestner, 2016).

Collectively, this research suggests that a promising approach for enhancing self-regulation might be to alter how effort is interpreted. We

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hypothesize that altering growth mindsets—in which people view their traits and abilities as malleable and capable of development rather than as stable and fixed—may serve as a promising approach for altering perceptions of effort and enhancing self-regulation. If mindsets of self-regulation can alter the meaning people attribute to experiences of effort, then perhaps cultivating a growth mindset of self-regulation can prevent the withdrawal of effort that so often leads to self-regulatory failure.

## 1. Effort in self-regulatory pursuits

Despite the benefits of exerting cognitive effort, people typically avoid effort when it is not absolutely necessary. This tendency has been termed the “law of least mental effort” (Balle, 2002) and has a long history in a variety of characterizations of humans as “lazy organisms” (McGuire, 1969) and “cognitive misers” (Taylor, 1981) dominated by a “drive for cognitive economy” (Baroody & Ginsburg, 1986). An example of direct empirical support for the law of least mental effort comes from Kool, McGuire, Rosen, and Botvinick (2010). Their paradigm, the demand selection task (DST), allows participants to repeatedly choose to complete one of two different subtraction problems, one of which imposes a greater demand on working memory capacity because it requires a carrying operation (Fürst & Hitch, 2000). Kool and colleagues showed that whether or not participants consciously noticed the difference in difficulty between the problems, they chose the easy problems at a rate significantly higher than chance, demonstrating an overall tendency to avoid effort (see also Kool & Botvinick, 2013).

Research has recently begun to illustrate the importance of *responses to effort* in people's self-regulatory pursuits. For example, people show reduced self-regulation on tasks where they perceive that such regulation produces increased experiences of effort, even when these experiences are manipulated independent of the task itself (Clarkson, Hirt, Austin Chapman, & Jia, 2011; Clarkson, Hirt, Jia, & Alexander, 2010), occur outside of conscious awareness, (Bijleveld, Custers, & Aarts, 2012; Marien, Custers, Hassin, & Aarts, 2012), or are merely imagined as occurring in the near future (Macrae et al., 2014). In addition, people are more likely to sustain self-regulation when these experiences of effort are either ameliorated or reinterpreted. That is, circumstances that enhance relaxation or boost tolerance for effort before or during goal pursuit—such as watching a humorous video clip or favorite television program (Derrick, 2013; Tice, Baumeister, Shmueli Blumberg, & Muraven, 2012), or meditating (Friese, Messner, & Schaffner, 2012), to name just a few examples—can also bolster self-regulation. Similarly, if people misattribute their experiences of effort during goal-pursuit to sources unrelated to this pursuit (Clarkson et al., 2010), reconstrue this effort as enjoyable (Laran & Janiszewski, 2011), or simply do not believe that these experiences are related to any limits in their capacity for self-regulation (Job, Dweck, & Walton, 2010; Job, Walton, Bernecker, & Dweck, 2015), this too bolsters such regulation. In sum, a growing number of empirical findings are demonstrating the importance of experiences of effort for self-regulation.

In addition, experiences of effort have also begun to take a focal role in recent attempts to understand the processes of self-regulation success and failure. For example, the *shifting priorities* model of self-regulation (Inzlicht et al., 2014) proposes that the aversiveness and decreased value people perceive in experiences of effort directly motivates them to cease self-regulation and focus on less effortful pursuits that are more immediately rewarding or pleasurable. Furthermore, the *opportunity costs* model of self-regulation (Kurzban et al., 2013) proposes that people use their experiences of effort and fatigue to decide whether the costs of maintaining self-regulation toward one particular goal would too greatly interfere with benefits that might be realized by pursuing alternative goals; thus, experiences of increased effort during self-regulation toward some objective are presumed to decrease the overall perceived value of sustaining regulation and increase the likelihood it will cease (Hockey, 2011). Similarly, the *motivated effort-allocation*

model of self-regulation (Molden et al., 2016) proposes that people weigh their experiences of effort against their experiences of progress when self-regulating toward a particular goal to determine whether they still feel it is currently worth dedicating their efforts toward this goal; as experiences of effort increase without sufficient increases in perceived progress the judged worth of self-regulation, and its likelihood of continuing, is presumed to diminish.

In short, on the whole, there appears to be a growing theoretical consensus for the central importance of experiences of effort for determining continued self-regulation and an increasing number of empirical demonstrations supporting this consensus. Any attempts to design an intervention to improve self-regulation would thus likely be well-served by focusing on methods for reliably altering people's experiences of effort in a way that could help them sustain such regulation. The primary objective of the present research is to develop one such method that draws upon the decades of experimental and longitudinal research suggesting that instilling a *growth mindset* could have just such an effect on these types of experiences.

### 1.1. Growth mindsets

Mindsets are constellations of beliefs regarding the fixedness or malleability of personal qualities, such as intelligence or extraversion. Some people believe a particular quality is an immutable trait (“you've got what you've got”) while others believe it is a malleable trait that can be cultivated through learning. Although fixed and growth mindsets tend to reflect fairly stable beliefs (Robins & Pals, 2002), they can also be situationally induced. For example, previous research has manipulated mindsets in a wide variety of domains across physical, intellectual, managerial, and personality dimensions (Aronson, Fried, & Good, 2002; Martocchio, 1994; Yeager et al., 2016; Jourden, Bandura, & Banfield, 1991; Mukhopadhyay & Johar, 2005; Burnette, Pollack, & Hoyt, 2010; Wood & Bandura, 1989; Paunesku et al., 2015; for a review see Dweck & Molden, 2005). These manipulations have ranged from brief inductions in the laboratory (e.g., Miele & Molden, 2010; Niiya, Crocker, & Bartmess, 2005; Nussbaum & Dweck, 2008), to targeted training programs (Paunesku et al., 2015; Yeager et al., 2014; Aronson et al., 2002), and even intensive multi-week interventions (e.g. Blackwell, Trzesniewski, & Dweck, 2007).

Altering mindsets, either through brief manipulations or intensive interventions, holds the potential for dramatic shifts in cognition, affect, and behavior. Considerable evidence from meta-analyses (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013) suggests that fixed and growth mindsets are each associated with a unique constellation of motivations, attributions, and response patterns that primarily arise in the face of challenge (for a review see Dweck & Molden, 2005). There are two well-established features of a growth mindset that are particularly relevant to the present research: attributions of effort and exertion of effort.

First, growth mindsets are associated with perceiving effort as useful rather than futile (Hong, Chiu, Dweck, Lin, & Wan, 1999; Miele, Finn, & Molden, 2011; Miele & Molden, 2010). This has been largely shown in the domain of intelligence. For example, in studies examining the effect of mindsets on individuals' judgments of their own learning, those with a growth mindset of intelligence interpreted high levels of effort as an indication that they were working hard to improve their ability to remember the information (Miele et al., 2011; Miele & Molden, 2010). In contrast, those with a fixed mindset of intelligence interpreted effort as an indication that they were reaching the limits of their ability to remember new information. Similarly, in an assessment and intervention conducted in a middle school math course, students with a growth mindset were more likely to believe that experiences of working hard are related to improvement, which in turn predicted higher math achievement (Blackwell et al., 2007). That is, students with a growth mindset endorsed statements like “The harder you work at something the better you'll be at it”, whereas students with a fixed mindset

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