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SPORTS PERFORMANCE

The Role of Self-Regulation and Control in Sport Performance

TAGS: self observation, ego depletion, self control, Marilia Coutinho, Willpower, sport performance, motivation, self-regulation, goal setting



Introduction: What Moves Us

Since I started the articles about “motivation” my goal was to answer the question: “What puts us in motion?”

The word “motivate” is etymologically derived from the Latin word *motus*, the past participle of *movere* (to move), origin of Medieval Latin *motivus* and the Old French *motif* (moving, will) and was added to the verb-forming suffix *-ate*. The current scientific understanding of motivation is closer to the etymological origin or the word than to its popular modern use. It means to “set in willful motion.”

The next step is to explore the “willful” part of the concept. What are the behavioral aspects of internally creating motion?

RECENT: The Role of Grit in Sport Performance

In this article, our journey will be along the thread that weaves together the concepts of self-regulation, self-control, self-efficacy, and self-motivation. All of them refer, in a way, to the idea of control, as opposed to being controlled. One must be in control or have autonomy, to set goals, move through intrinsic and extrinsic motivators, and grittily, hardily, toughly keep on track. That is true for all long-term activities involving performance and learning, with sport being one of the most rigorously determined by these related cognitive-affective phenomena.

Self-Control and Self-Regulation

This story starts with something called “executive function.” Executive function is what the expression says: the function of deciding to execute something. It is one of the neurological and behavioral traits that characterize modern humans (Coolidge and Wynn 2001).

Executive function is not a single function but rather a set of neurologically determined cognitive processes through which the individual may exert control over his own behavior in order to optimize the achievement of a goal. That includes selecting, monitoring, and facilitating some behaviors while inhibiting others. Repressing an impulse, for example, is an inhibitory control over behavior.

You may ask, “Don’t we always decide how to act?” Not really. The executive system is mobilized to act according to real-time decision-making, rather than an automatic or prepotent response. A prepotent response is one that the individual is ready to provide (Harriet 2009), triggered automatically by a stimulus (Diamond 2013, Hofmann et al 2009, Plutchik 2001). The executive system overrides the prepotent response. The prepotent response may be an impulse or a conditioned response.

WHERE WE ARE IN THE “MOTIVATION” ISSUE:

- Motivation implies goal-setting. Goal-setting involves planning.
- Planning is the cognitive process of designing a course of action and overriding unplanned responses.
- An unplanned response is an impulse or a conditioned response.
- Motivation requires cognitive (thinking) control and inhibiting automatic action in order to stick to a plan.

An impulse is a response to a specific activation stimulus from the environment with a strong incentive of immediate gratification. Impulses are strong neurologically driven responses for a reason: In order to survive, animals need to have hard-wired, fast responses to physiological needs, threats, and other survival demands. For example, the impulse to drink water when one is thirsty or the impulse to hide during a shooting. Impulses are driven by hedonistic (pleasure) or negative drives (fear, anger).

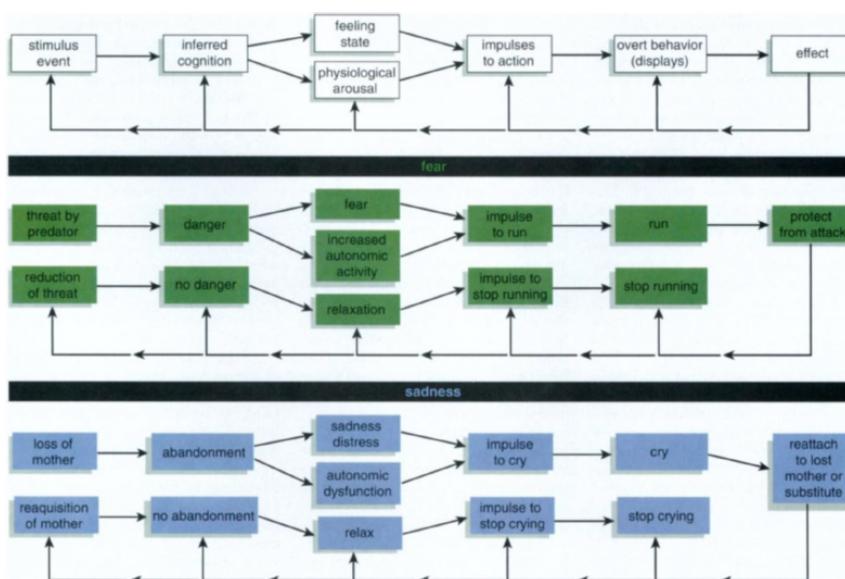


Figure 4. Feedback loops in emotion show how sensory information is evaluated and translated into action or some other outcome that normalizes the relationship between the individual and the triggering event. The inner state perceived as fear may arise from a threat that is perceived as “danger”; the fear triggers an impulse to flee, which results eventually in reduction of the threat. A similar set of homeostatic processes can be seen in the case of sadness in a child experiencing loss of her mother.

From Plutchik (2001)

This is all fine if we just need to survive on the short-term. The pursuit of long-term goals, though, requires inhibiting impulses. That's where the executive system determines or modulates action. The executive system is a set, rather than one cognitive function, associated with different brain activities (Barber & Carter 2004).

There is still no agreement about which executive functions constitute executive control (EC or the executive system), but there is a general consensus (Miyake & Friedman 2012, Friedman et al 2008) on the following:

- Executive functions are a collection of related but separate abilities;
- The three most studied and less controversial are prepotent response inhibition, updating working memory, and task shifting;
- They show individual variation in the human population;
- They are predominantly genetically determined;
- While EC individual variability is genetically determined, the EC/ES's development is socially influenced. As with most traits, in each stage of life, it is the result of the interplay of nature and nurture. Socioeconomic origin is critical, but executive functions can be trained (Sarsour et al 2011, Thorell et al 2009, Diamond 2012, Diamond & Ling 2016).

The Nature of Self-Control

Self-control is one aspect of the inhibitory control of prepotent responses.

There is no consensus as to how exactly self-control is exerted. The strength model of self-control offers a robust set of empirical evidence. Baumeister and collaborators (2007) have defined self-control as the capacity to override temptations, or impulses that are not consistent with a given goal or set of values. His group observed early in the 1990s that self-control seemed to be vulnerable to deterioration over time, after repeated exertions, much like physical fatigue. It was conceptualized as a "limited resource" and its exhaustion, "ego depletion." Experiments with a group challenged by a self-regulation demanding task (resisting eating chocolate, for example) and an unchallenged group showed that, with time, the challenged group loses performance.

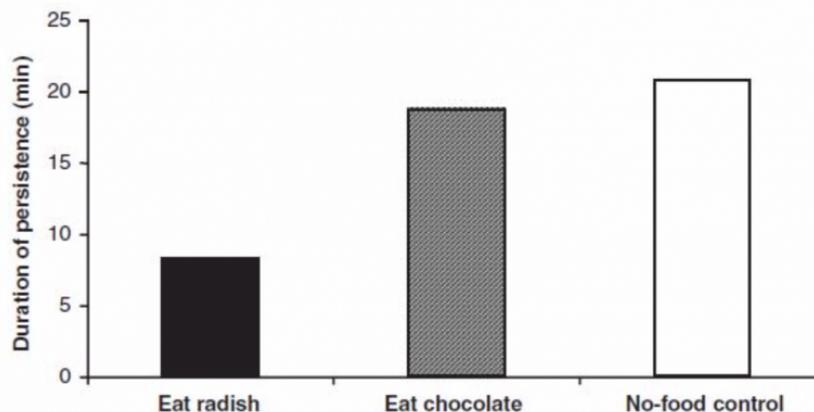


Fig. 1. Speed of giving up on an unsolvable task after eating chocolate or exerting self-control to resist chocolate in favor of radishes on a previous task (as compared to a no-food control). From Baumeister, Bratslavsky, Muraven, & Tice, 1998.

From Baumeister et al. 2007

Several studies have suggested that there might be depletion-mitigating procedures or situations, such as humor, alternative cognitive approaches, and certain cultural resources.

BOX 1.*Contexts, Moderators, Mediators, and Implications of the Limited-Resource Effect*

Responses that require self-regulation include

- Controlling thoughts
- Managing emotions
- Overcoming unwanted impulses (e.g., not eating tempting candies because of being on a diet)
- Fixing attention
- Guiding behavior
- Making many choices

Behaviors that are sensitive to depletion of self-regulatory resources include

- Eating among dieters
- Overspending
- Aggression after being provoked
- Sexual impulses
- Intelligent and logical decision making

Interpersonal processes that require self-regulatory resources include

- Self-presentation or impression management
- Kindness in response to a partner's bad behavior
- Dealing with demanding, difficult partners
- Interracial interactions

Moderators of ego depletion include

- Heightened motivation to achieve a goal
- Collectivistic cultural background

Physical indicators of ego depletion include

- Heart-rate variability
- Neural changes using electroencephalograph methods

Mediators of ego depletion include

- Subjective time perception (time perception is elongated—i.e., time moves slowly)
- Blood-glucose levels

Harmful effects of depletion may be counteracted through

- Humor and laughter
 - Other positive emotions
 - Cash incentives
 - Implementation intentions (“if ... then” plans)
 - Social goals (e.g., wanting to help people; wanting to be a good relationship partner)
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-

From Baumeister et al. 2007

Like in sports, ego-depletion fatigue is temporary (Evans et al 2016).

One approach to reducing ego-depletion is to decrease the task effort by *introducing automatic responses* (Wieber & Gollwitzer 2016). We saw that one of the purposes of executive function was to provide tools for decision-making under uncertainty. That can only be accomplished by overriding prepotent responses and creating, through willful effort, a new strategy. Depletion is a result of exerting effort faster than recovery can replenish the resource.

Think about the learning stage of a sport-specific motor skill: It is exhausting and clumsy because most tasks are still not automatic.

Controversy still exists, but the ego-depletion model stands strong (Dang 2018).

Regardless of whether or not self-control is a limited resource, the lay belief that willpower is limited seems to be detrimental. While researchers have access to the variables involved when they study self-regulation demanding tasks, the subjects don't. If they assume their willpower will be exhausted sooner or later, their performance will be poorer than if they assume their willpower is unlimited (Bernecker 2016).

The harder the task, the more detrimental the limited willpower theory will be to the performer:

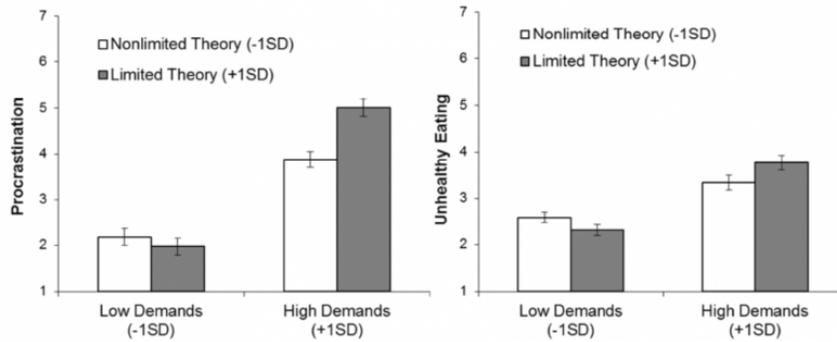
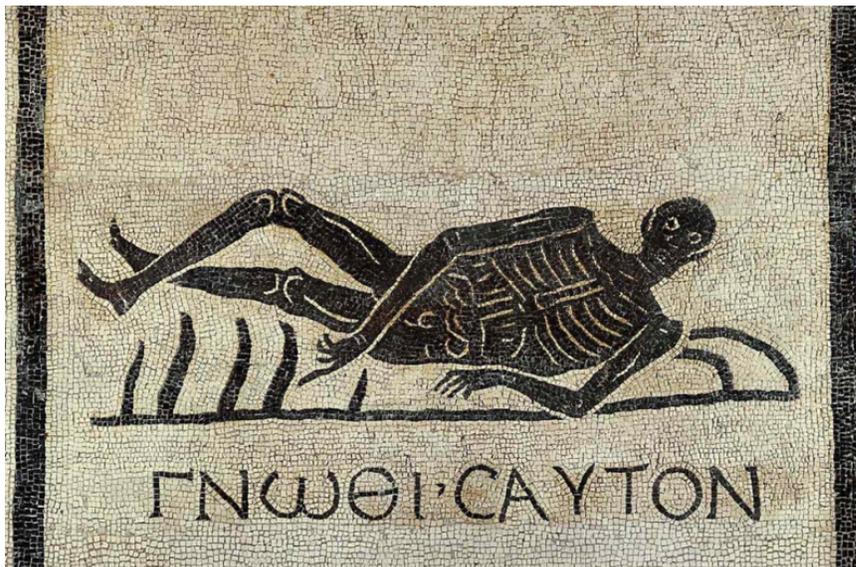


Figure 2. Mean procrastination and unhealthy eating as a function of self-regulatory demands and willpower theory.

From Bernecker 2016

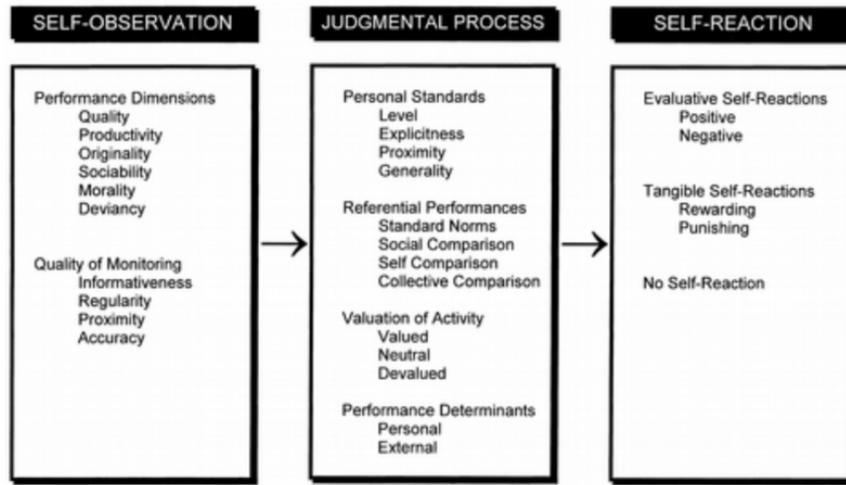
This is relevant to coaching strategies and athlete management.

Self-Efficacy: “Know Thyself”



Memento Mori mosaic from excavations in the convent of San Gregorio, Via Appia, Rome, Italy. Now in the National Museum Bath of Diocletian, Rome, Italy. The Greek motto *gnōthi sauton* (*know thyself, nosce te ipsum*) combines with the image to convey the famous warning: *Respice post te; hominem te esse memento; memento mori*. (Look behind; remember that you are mortal; remember death.) – public domain (The artist is unknown. - Lessing Photo Archive: <http://www.lessing-photo.com/p3/110103/11010329.jpg>)

Albert Bandura (1991) explained that self-efficacy is a part of self-regulatory behavior. Through the beliefs people form about what they can do, they may exercise forethought and motivate themselves in an anticipatory proactive way. That is how personal agency plays a determinant role in purposeful behavior.



From Bandura (1991)

To form a self-efficacy representation, a person necessarily must observe and monitor himself or herself and elaborate an ongoing diagnostic. In well-organized activities such as academics or sports, people have the tools to accurately observe themselves through quantitative measures. Goal-setting and self-monitoring feedback into one another; there is no observation and diagnosis in the void. You can only observe, monitor, and measure your performance in a specific context with specific standards. How fast are you? How fast are you relative to your goal's standards? What is your deadlift PR today? What is the (world/regional) record? In several activities, these standards are externally determined, making it easier to conduct precise observations. The goal itself, though, is wider than meeting a standard.

Self-observation enhances performance (motivation in action) when there is clear evidence of progress and clear goals. In this scenario, the higher the goals, the more the performance increases:

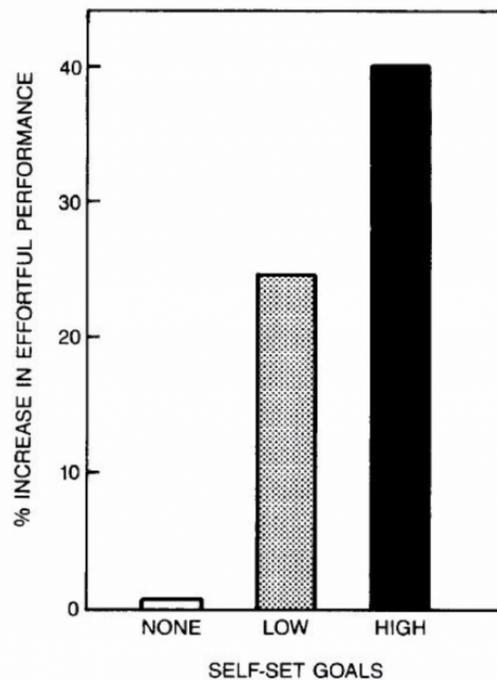


FIG. 2. Mean increases in motivational level under conditions of performance feedback alone depending on whether people continue to perform the activity without goals or spontaneously set low or high goals for themselves. Plotted from data of Bandura & Cervone (1983).

Realistic self-monitoring with high self-efficacy is correlated to success. Self-monitoring that over-emphasizes failure, however, produces negative performance results. Unrealistic positive self-diagnosis is catastrophic for the same reasons.

WHERE WE ARE IN THE "MOTIVATION" ISSUE:

- Motivation implies goal-setting. Goal-setting involves planning.
- Planning requires a realistic appraisal of the steps involved in achieving the goal as well as one's ability to follow them
- Self-efficacy, or the ability to judge how well one is equipped for the task is essential to the "motivational architecture" (goal setting, passion, hope, grit, and self-regulation)

Self-Control and Self-Regulation in Sports and Exercise

Self-control and self-regulation in sports are associated with the maintenance of motivation and goal structure, which organize and drive successful performance. Studies show that regular strength and aerobic training (necessary components of sports training) stimulate executive function, therefore, self-control and self-regulation. There seems to be a measurable cognitive improvement after acute exercise and sports tasks that require self-regulatory functions (Brush et al 2016, Heath et al 2018). Is this carry-over instead of depletion?

The opposite – experimental self-control exhaustion on a cognitive task and its effect over exercise – seems to confirm the depletion hypothesis (Boat et al 2018).

Few studies have measured the effects of elite sports training over self-regulation on other types of tasks (Diamond 2015).

The principles of self-regulation within an executive control approach hold, of course, but we don't know how sports self-regulatory tasks interact with other life tasks.

Dangerous Interactions: Integrated Self-Regulation

As much as the virtuous cycle of self-control and self-regulation in exercise tend to optimize health and well-being, requiring less investment, the loss of self-control in one key area of life, has a contagion or trickling down effect over others.

One interesting hint at this is that things that affect executive function, like sleep deprivation, have a detrimental effect over all self-regulated behaviors. Taking the sleep deprivation example:

- Executive function indicators show a decrease.
- Self-control over food cravings becomes much harder as cortisol levels rise, leptin declines, ghrelin production increases, and cognitive functions in general decrease.
- There is generalized cognitive function decrease. That also means they require more and more effort.
- Several physiological functions are impaired, academic production is affected as well as emotional control.
- Inter-personal relations and functions mediating them degenerate.
- If chronic, sleep deprivation is associated with depression, substance abuse, and suicide.

Certain substances lead to disinhibition. Disinhibition feels good (hedonic experience) and may lead to more immediate gratification behaviors at the cost of self-regulated behavior. Studies suggest that substance abuse may be both a cause and a consequence of impulsivity (De Wit 2009).

Is it possible to achieve and maintain:

- Elite performance levels in sports;
- Exceptional academic performance;

- Overall health reflected in self-regulated eating behavior, regular sleep, sex, and mental habits;
- And healthy interpersonal relationships.

while failing to develop self-control over another area of life? For example:

- Can an elite athlete be a gambler?
- Can a world-class scientist be an alcoholic?
- Can a highly productive and talented artist have poor eating, sleep, and relationship behaviors?

Yes, they can, and these cases make the news, leading people to believe that they are the rule. They are not. These cases are usually associated with a prevalent role of talent over cognitive or personality traits that require effort to maintain. Eventually, the deficit in executive function may catch up with the rest of the individual's behavior. It can also accelerate death, so they die as extremely successful in certain areas of their lives while a total mess in others.

I am not aware of studies highlighting the interaction between self-regulatory behaviors. Depletion may explain extreme cases: Self-regulatory resources are allocated to certain tasks, and there are none left for others.

The takeaway from all this is that the construction and maintenance of a sturdy motivational architecture requires effort. Even if it is possible (or necessary) to sacrifice self-control over certain behaviors to excel in others, there requires a great deal of compartmentalization.

If your choice is to be or continue being a successful high-performance athlete, though, it is a good idea to accept that true, scientifically defined motivation is in part a gift from mom and dad but requires your willful effort to keep it that way.

The Takeaways

- Executive functions are an inherited trait.
- Life will present uncertainty and disruptive experiences. How many and to what extent they will impact you is unpredictable. Your executive functions are the cognitive tools to manage uncertainty.
- As a corollary to that, your athletic career also contains uncertainty. Without self-regulatory responses, specifically self-control, your career might become catastrophic.
- The more you educate yourself, the better equipped you are to self-regulate your behavior.
- Self-control, when successful, generates more self-control with less effort.
- Don't overdo. Exert self-control within reasonable limits.
- Self-monitor with special attention to successful results. Use failures as a learning tool.
- Avoid engaging in potentially dangerous and life-disruptive impulsive behaviors. Use impulsivity with moderation.
- Think probabilistically: Life will probably be a long-term experiment. If your sport plays a central role in your life, you need to have goals and a plan. You must self-regulate your behavior.

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The Role of Mental Toughness in Sport Performance



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