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Goal striving and endurance performance

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Introduction

"I intend to run a sub 2:30 marathon!", "I want to win this competition!", or "I won't let my opponents lure me into an exhausting pace!" These intentions can be considered to reflect goals, and setting goals like these can form the basis for successful endurance performance. This is in line with meta-analytic evidence showing a positive correlation between intentions and subsequent behavior (r = 0.53; Sheeran, 2002) and a medium effect of goal setting on endurance performance (Δ = 0.34; McCormick, Meijen, & Marcora, 2015). Yet, these numbers also reflect an experience that every endurance athlete – including the three authors – is probably familiar with: a goal set is not necessarily a goal met.

Gaps between intentions and behaviors are a key research topic in psychology (Sheeran & Webb, 2016). A well-known example is New Year's resolutions: whereas an estimated 40 per cent of US Americans make resolutions, less than 10 per cent achieve them (Statistic Brain, 2017). In the domain of physical exercise, only one in two people successfully act upon their intentions (Rhodes & de Bruijn, 2013). To understand this notorious intention-behaviour gap, it is not sufficient to focus on *goal setting* alone, one also has to account for the process of *goal striving* (i.e., translating an intention into goal-directed behaviour; Heckhausen & Gollwitzer, 1987; Kuhl, 1983). People might face a variety of difficulties when pursuing their goals, including failures to initiate goal-directed behaviors, to hedge against internal and external interferences, and to bring goal pursuit to a successful close (Gollwitzer & Oettingen, 2016; Sheeran & Webb, 2016). Overcoming these difficulties requires an effective self-regulation of emotions, thoughts, and actions (Hagger et al., 2016).

Relative to goal setting, the process of goal striving has received little attention from endurance researchers and practitioners alike. This is unfortunate because it creates blind spots in our knowledge about endurance performance. In the present chapter, we discuss the relevance of goal striving for endurance performance, along with common difficulties. Moreover, we introduce the self-regulation strategy of forming implementation intentions (Gollwitzer, 1999, 2014) as a promising tool for dealing effectively with the difficulties of goal striving.

Goal striving and its difficulties

A) Getting started

Failures to initiate goal-directed behaviors are a first obstacle during endurance performance. People struggle with getting started for various reasons: it can be difficult to remember or recognise situations where goal-directed actions can be taken and these actions might be unpleasant or arduous. For example, in road cycling it is important to be well positioned at key moments of a race. Wind, crashes, and features of the course can all split the peloton and many races have been lost because of poor positioning at crucial moments. In 2016, multiple Tour de France champion Chris Froome seemingly lost the Vuelta a España[1] in the 15th stage to Formigal. Froome's Team Sky did not expect major attacks to happen right at the beginning of the stage. Two favorites in the race, contrary to the expectations of Team Sky, did attack very early and caught Chris Froome and his team by surprise. Here is what Ian Boswell, one of Froome's teammates, had to say about the situation (Hood, 2016):

> We got over that first climb, before you knew it, there was a group with not only just Contador but also with Quintana. When we got over that hill into the flat, we had three riders in the second group, and five riders in the third group. We were chasing full gas in the third group, and the gap just kept going up … it just happened so quick. We had just done 14 days of racing, … we were toe to toe with Quintana and Froome, and then just 8km into the race, everything changed. … If you let your guard down 10 minutes into the race, there are 15 riders up the road. As teammates, we should have been there. Froome maybe should have followed Quintana. As [a] group, maybe we should have come together. You can't put your finger on it; it is not just one particular incident. It was a perfect storm.

Boswell's account of the event vividly illustrates how missing a single opportunity to act can lead to the loss of a 3-week bike race. Being able to initiate goal-directed behaviours in critical moments during a competition requires that one remembers to act, is ready to seize opportunities as they emerge, and has prepared oneself to act in a goal-directed manner (Sheeran & Webb, 2016). As Team Sky's example illustrates, even these seemingly easy tasks can get overwhelming during an athletic competition,

where a host of situational, psychological, and physiological stresses are present simultaneously.

B) Staying on Track

Once goal-directed behaviour has been successfully initiated, one has to stay on track. This can be challenging for various reasons. By definition, endurance activities require prolonged effort and athletes can experience various kinds of interferences that might derail successful goal pursuit (McCormick, Meijen, & Marcora, 2016). Some interferences come from a macro level, such as difficulties in investing the time needed for training or struggling to find a training regimen that works. Other interferences act more as micro stressors. For example, before an important event athletes may worry about things going wrong. During competition or training, they may worry about optimising their pacing strategy and staying focused, all while having to deal with the aversive sensations that accompany endurance exercises (McCormick et al., 2016). Sometimes such interferences can be external, as demonstrated by the case of 400-metre Olympic champion Shaunae Miller-Uibo during the 2017 athletic world championships. Miller-Uibo was well on track to win the 400-metre^2 gold medal when she suddenly slowed in the closing meters of the race and eventually even missed out on a medal. After the competition, she reasoned as follows (Kelner, 2017): “I had the race under control and I looked up at the screen and misplaced my foot and completely lost balance”. Evidently, even the tiniest interferences from the environment can put an athlete literally off track, and even elite level athletes are not immune to such interferences.

Athletes have to deal with a variety of internal influences as well, such as exercise sensations (e.g., sustaining high levels of pain and exertion), emotions (e.g., not getting frustrated by a head wind in a time trial), intrusive thoughts (e.g., defying worries about the appropriateness of the pacing strategy), or impulses (e.g., keeping the pace despite the urge to slow down). These influences can interfere, for instance, with how effectively athletes monitor their goal progress during the race and adjust to discrepancies. In the 2008 Dubai Marathon, Haile Gebrselassie would have earned one million dollars had he beaten the world record. However, he failed to stick to his pacing strategy and started too fast (first half in 61:27 minutes), and subsequently could not maintain his initial pace (Eder, 2008): “I wanted to do 62 minutes for halfway, and I paid the price in the final stages. You know, everything needs to be perfect, and today,

I missed one little thing." As this example suggests, whether or not athletes follow through with a pacing strategy does not only depend on their physiological capacities and the characteristics of the race (Abbiss & Laursen, 2008) but also on subtle psychological and contextual influences.

The regulation of interferences during endurance performance is aggravated by the substantial demands that accompany the activity itself (e.g., Grego et al., 2005; McCormick et al., 2016). These favour automatic over deliberate processes because they require less time, conscious awareness, and cognitive resources (e.g., Brand, Wolff, & Baumgarten, 2015; Evans & Stanovich, 2013). For example, merely thinking about running at high intensity can automatically elicit aversive sensations, although there might be good reasons to evaluate running fast positively (e.g., because one might win a gold medal by doing so). Such automatic processes are generally difficult to control, and this is especially true during an exhausting endurance activity. A similar reasoning pertains to unwanted habits, which can be easily activated by encountering certain situational features (e.g., Snow, 2006) and exert particular influence on behavior under stressful conditions (Schwabe & Wolf, 2009). As an example, consider the 15th stage of the 1998 Tour de France.[3] This stage took place under atrocious conditions and race leader Jan Ullrich lost almost nine minutes on the eventual winner Marco Pantani, reversing what had been a three minutes lead to a six minutes deficit. Crucially, this spectacular loss was not only caused by the rain and the cold; Ullrich simply did not eat in the last part of the stage (Schuele, 2003). Refueling during competition is often a deliberate, preparatory act (i.e., one eats and drinks long before one feels hungry and thirsty). Thus, athletes have to actively decide to refuel even though they might not feel like eating or drinking at the moment (i.e., the automatic habitual response would be not to eat and drink).

C) Bringing Goal Pursuit to a Successful Close

Finally, successful endurance performance requires bringing goal pursuit to a successful close. One implication is that athletes should not ease off before having reached their goals. Going back to the case of Miller-Uibo discussed above, one might also argue that the loss of concentration that caused her to lose the 400-metre race reflects a premature easing off before reaching the finish line. This reasoning is supported by research showing that people tend to reduce their efforts when they feel sure about attaining their goal (Louro, Pieters, & Zeelenberg, 2007). Whereas this

finding is counter-intuitive, people generally interpret positive feedback on their rate of goal attainment (e.g., feeling good) as a signal that they can attend to something else (Carver, 2003). Recall that in the final moments Miller-Uibo felt that she had the race under control and victory was very likely.

However, successfully closing goal pursuit at times also requires disengaging from futile goal striving (Wrosch, Scheier, Carver, & Schulz, 2003). This can help athletes to save resources (e.g., for the following stages of a competition) and to stay healthy (e.g., avoiding injuries from overextension). The history of endurance sports is full of examples in which athletes failed to disengage, and even died from overextension. Probably the most famous example is the legend of Pheidippides, a messenger who ran about 42 km from the city of Marathon to Athens to deliver news about the victorious battle against the Persians (Pheidippides, n.d.). After delivering the news he collapsed and died.

Thus, to manage the last challenge of goal striving, one has to stay focused until the end while at the same time being able to recognise when further goal striving would be detrimental (Sheeran & Webb, 2016). In addition, one has to make the decision to disengage from a futile goal and then effectively act on this decision (i.e., to stop). The example above underlines that such disengagement is easier said than done when a lot is on the line.

Implementation intentions

So far we have painted a gloomy picture of goal striving in endurance activities. However, our review also shows that athletes can facilitate their goal attainment in various ways: by swiftly attending and responding to emerging opportunities and obstacles, using tailored pacing strategies and shielding them from external and internal interferences, developing favourable automatic evaluations of task demands, monitoring goal progress, and disengaging from futile goals, and so on. In what follows, we introduce research on a simple but highly effective strategy that might help athletes to implement these goal-directed behaviours. It involves mentally linking an opportunity to act or mentally linking an obstacle for goal attainment to a goal-directed behavior in an if-then format: “If I encounter opportunity/obstacle O, then I will perform goal-directed behaviour B!” Making such if-then plans is a self-regulation strategy which is commonly referred to as forming *implementation intentions*

(Gollwitzer, 1999) and contrasted from merely setting goals that specify a desired outcome or behavior ("I want to reach outcome O / show behaviour B!"; Triandis, 1977).

Plenty of research has focused on *whether* implementation intentions facilitate goal attainment beyond goal setting and findings of this research generally provide an affirmative answer across several domains (e.g., health, academic, and interpersonal; Gollwitzer, 2014; Gollwitzer & Sheeran, 2006). Other research has focused on *how* implementation intentions achieve these beneficial effects. In a nutshell, implementation intentions automate both the detection of critical situations (opportunities or obstacles) and the initiation of planned behaviors (Webb & Sheeran, 2007), basically putting goal-directed behaviour on autopilot. It is therefore conceivable that athletes using implementation intentions to 'seize the moment' or to overcome obstacles during endurance performance are more likely to attain their goals.

Using implementation intentions to deal with the difficulties of goal striving

When people specify a critical situation (opportunity or obstacle) in the if-part of an implementation intention, this situation becomes mentally activated and receives attentional and perceptual priority (Achtziger, Bayer, & Gollwitzer, 2012; Janczyk, Dambacher, Bieleke, & Gollwitzer, 2015). This makes the situation easy to detect and recognize (Aarts, Dijksterhuis, & Midden, 1999), increasing the probability that planned goal-directed behaviours are initiated in the right place and at the right time. For instance, insufficient rehydration during endurance performance is widespread because many athletes fail to use opportunities to drink, with adverse effects on performance and health (Casa et al., 2000). As we have argued above, such interference from automatic drinking habits might derail goal attainment because it forces people to give up on their goals rather than to stay on track. However, this problem can be tackled with implementation intentions: in one study (Hagger & Montasem, 2009), planning to drink carbohydrate-electrolyte drinks during exercise boosted consumption by more than 50 per cent compared to a control group and significantly improved physiological markers of rehydration. This suggests that athletes could use implementation intentions to replace their drinking habits by recommended rehydration schedules during an endurance performance.

Another feature of implementation intentions is the strong associative link that is forged between the critical situation and the goal-directed behaviour specified in the then-part. This enables behaviour to be initiated immediately, efficiently, and independent of further conscious intent (e.g., Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009; Brandstätter, Lengfelder, & Gollwitzer, 2001; Gollwitzer & Brandstätter, 1997; Wieber & Sassenberg, 2006). These features of automaticity are crucial for successful goal striving. First, implementation intentions are rather independent from resources like time to think or cognitive capacity, which are usually scarce during endurance performance. Second, automating goal directed behaviour puts it on a par with other, potentially unwanted automatic processes such as bad habits.

Successful endurance performance also hinges on warding off both external (e.g., spectators, weather conditions, faulty equipment) and internal (e.g., negative emotions, disruptive thoughts) interferences, which can be accomplished with implementation intentions. First, planning how to ignore involuntarily distractions results in better task performance than merely setting goals to do so (Gollwitzer & Schaal, 1998), which might help athletes to better keep up their concentration (Moran, 1996). Second, implementation intentions can be used to regulate a variety of emotional influences on behaviour (meta-analysis by Webb et al., 2012). For example, professional tennis players who formed implementation intentions to deal with intrusive thoughts, feelings, and physiological states during a critical match enhanced their performance and physical fitness compared to other players (Achtziger, Gollwitzer, & Sheeran, 2008).

Finally, implementation intentions have been shown to facilitate a successful closing of goal pursuit. Behaviours specified in implementation intentions are performed more persistently in the face of difficulties (Freydefont, Gollwitzer, & Oettingen, 2016; Legrand, Bieleke, Gollwitzer, & Mignon, 2017). This effect is commonly associated with the automaticity afforded to behaviors specified in an implementation intention. Yet, implementation intentions are effective only when people are committed to an active superordinate goal (Sheeran, Webb, & Gollwitzer, 2005). For example, when a runner is not committed to the goal of achieving a personal best, implementation intentions tailored to this goal should not be effective. People also flexibly disengage from implementation intentions when their goals change or when performing the planned behaviour becomes excessively costly (Legrand et al., 2017). This ‘flexible

tenacity' is important for endurance performance because it might allow athletes to push their limits while avoiding injuries or mistakes resulting from overextension. Implementation intention might also be directly used to avoid overexertion; for instance, by making plans to adapt to changing circumstances or requirements (Doerflinger, Martiny-Huenger, & Gollwitzer, 2017; Wieber, Thürmer, & Gollwitzer, 2015).

Implementation intentions and endurance performance

Taken together, research on implementation intentions suggests they can serve as a highly promising self-regulation tool for dealing with various difficulties with goal striving in endurance performance. They are simple to use (see Figure 9.1) and likely allow athletes to attain their goals even under stressful and demanding circumstances. It therefore comes as no surprise that scientists (e.g., Achtziger et al., 2008; Brick, MacIntyre, & Campbell, 2016; McCormick et al., 2016), athletic institutions (e.g., Calder, 2009), and the popular press (e.g., Gregoire, 2016) alike suggest forming implementation intentions as a strategy for improving endurance performance. However, whereas implementation intentions are known to facilitate engagement in physical activity behaviour (meta-analysis by Bélanger-Gravel, Godin, & Amireault, 2013), surprisingly few studies have tested their effectiveness in the context of a specific endurance activity.

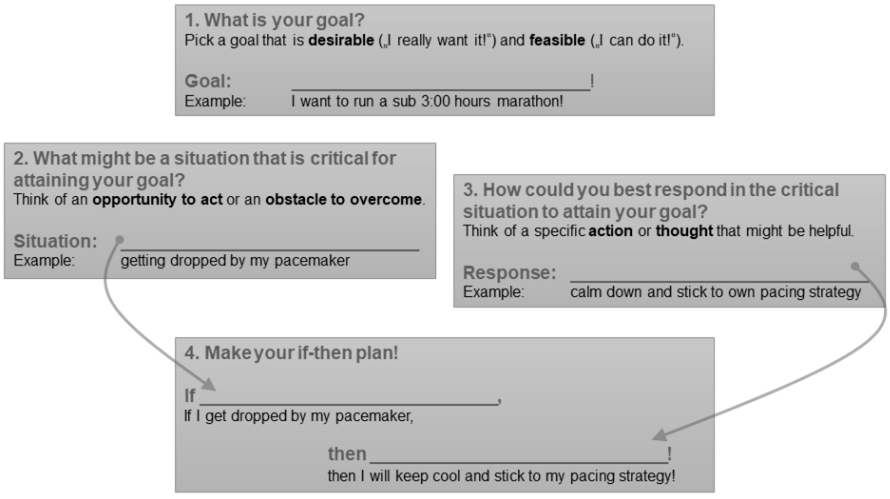

Figure 9.1: The steps involved in forming an implementation intention

One study (Thürmer, Wieber, & Gollwitzer, 2017) tested whether implementation intentions facilitate performance when groups of three people were required to jointly

hold a medicine ball for as long as possible. Groups with the implementation intention 'And if our muscles hurt, then we will ignore the pain and tell ourselves: We can do it!' performed longer than groups with a control instruction ('We will ignore our muscle pain and tell ourselves: We can do it!'). Follow-up analyses suggest an increase in communicative interactions among implementation intention group members as a reason underlying this finding. Another study did not find beneficial effects of implementation intentions in an individual static muscular endurance task (Bieleke & Wolff, 2017). Participants who made plans to down regulate their exhaustion during the task ("If the task becomes too strenuous for me, then I ignore the strain and tell myself: Keep going!") failed to outperform participants in a control condition with no such plan. Interestingly, those in the implementation intention condition became exhausted even more rapidly than those in the control condition but were at the same time willing to reach higher levels of exhaustion. A similar pattern emerged for perceived pain. These results suggest that forming implementation intentions can affect perceived exertion and pain during endurance tasks without necessarily improving performance.

Additional data from our lab complements the findings of Bieleke and Wolff (2017) with data obtained with functional near-infrared spectroscopy (Wolff et al., 2018). Participants this time planned to down regulate perceived pain ("If my arms hurt, then I will ignore the pain and tell myself: Keep going!") before performing the task. Compared to a control condition, this plan did not lead to differences in perceived exhaustion or pain in the implementation intention compared to a control condition; moreover, we again did not observe a difference between conditions regarding endurance performance. Interestingly, the activation of the lateral prefrontal cortex – a brain region associated with effortful control (e.g., Cohen & Lieberman, 2010) – was significantly lower in the implementation intention condition. This is in line with prior neurophysiological research (Gilbert, Gollwitzer, Cohen, Burgess, & Oettingen, 2009) and suggests that implementation intentions might reduce the perceived effort during endurance exercises.

To summarise, to date it is not clear whether implementation intentions can reliably enhance endurance performance during a specific physical activity. Whereas it seems that task relevant processes can indeed be affected (e.g., perceived exertion), additional

research has to investigate how implementation intentions must be formed to facilitate performance during a specific endurance activity. This is especially important because the effects of implementation intentions may depend quite strongly on the selected critical situations and behaviours – for instance, when dealing with negative sensations (Schweiger Gallo, McCulloch, & Gollwitzer, 2012). Also, research on implementation intentions has revealed conditions under which implementations intentions are more or less effective. For instance, athletes might find it intuitive to make several plans to attain their goals or to make backup plans in case one plan cannot be acted on – both of which can be detrimental to the effectiveness of implementation intentions (Verhoeven, Adriaanse, de Ridder, de Vet, & Fennis, 2013; Vinkers, Adriaanse, Kroese, & de Ridder, 2015). However, whether such results can be directly transferred to endurance performance is an open question. For instance, we are not aware of any study that tested the effect of implementation intentions on performance in a whole body endurance activity.

Conclusions

Goal setting is an important first step for successful endurance performance, but athletes also have to effectively strive for their goals. During goal striving, athletes are confronted with multiple difficulties: getting started (e.g., recognize and respond to race-defining attacks), staying on track (e.g., not losing concentration during the race), and successfully closing goal pursuit (e.g., pulling out of a race when continuation would be hazardous). Each of these challenges is accompanied by specific psychological demands and successful goal attainment requires that athletes deal effectively with each of them. One promising psychological strategy to facilitate this process of goal striving is to form implementation intentions (i.e., if-then plans).

Implementation intentions facilitate goal striving by allowing people to efficiently attend and respond to critical opportunities and obstacles, thereby enhancing goal attainment across a variety of domains. For instance, they should be helpful for initiating and adhering to a training regimen. Yet, the effects of forming implementation intentions on endurance performance have rarely been investigated. The existing evidence suggests that implementation intentions can indeed affect parameters relevant during endurance activities (e.g., perceived exertion; Marcora, 2008). However, these effects might be unexpected and do not necessarily improve performance. Accordingly,

the conditions under which athletes can use implementation intentions to enhance their performance have yet to be explored, especially during whole body endurance activities such as cycling and running. Moreover, research is needed to investigate in which athletic situations implementation intentions are helpful, and the goal-directed behaviours that they can facilitate. Until this research is done, we advise practitioners to test the effects of a specific implementation intention in training settings before using it during a competition.

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Notes

1 The Vuelta a España is a three-week stage race and is regarded as one of the most prestigious in road cycling.

2 While 400-meter running does not strictly comply with the operational definition of endurance as adopted in this book, it nevertheless underlines the intricacies of staying on track during an athletic activity.

3 Like the Vuelta a España, the Tour de France is a three-week stage race and is widely regarded as the most prestigious race in road cycling.