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Acquiring expertise in sports requires high levels of self-regulation and self-motivation (Kitsantas & Kavussanu, 2011). Elite athletes and coaches often mention self-regulation as one of the most important factors for their success. For example, top college football coach Lou Holtz said "Without self-discipline, success is impossible, period."[1] Similarly, researchers and practitioners have focused their attention on gaining a better understanding of athletes' self-regulatory functioning in sport, exercise, and physical education contexts (Gaudreau, 2014). In this chapter, we describe key processes of athletes' self-regulation from a social cognitive self-regulatory perspective (Usher & Schunk, 2018; Zimmerman, 1989). We use the term "self-regulation in sport" to refer to self-initiated thoughts, feelings, and actions that athletes use to attain various goals (Zimmerman & Kitsantas, 2005). First, we review a social cognitive cyclical model of self-regulation that describes key self-regulatory processes and motivational beliefs. Second, we discuss empirical studies that have examined athletes' acquisition of key self-regulatory processes (e.g., goal-setting, goal orientation, self-monitoring and self-evaluating) and coach influences such motivational climate on athletes' self-regulatory functioning. Third, we discuss implications for practice regarding how to enhance learning and performance in sports using social learning experiences. Finally, we provide directions for future research.

A Social-Cognitive Perspective of Self-Regulation in Athletes

Zimmerman (2000) developed a social cognitive model of self-regulation that includes motivational beliefs and cognitive processes in three cyclically interrelated phases: forethought, performance, and self-reflection. The *forethought* phase precedes athletes' engagement in a task and includes task analysis processes (e.g., goal setting and strategic planning) and motivational beliefs (e.g., self-efficacy, task value, goal orientation) that facilitate athletes' preparation and

[1] All quotations are drawn from news sources and interviews.

motivation to engage in self-regulated learning. Elite athletes and coaches often comment on the importance of these forethought processes. For example, former top tennis player Chris Evert stated "You've got to take the initiative and play your game. In a decisive set, confidence is the difference", whereas football coach Homer Rice commented on the importance of self-motivation in learning and performance: "You can motivate by fear, and you can motivate by reward. But both those methods are only temporary. The only lasting thing is self-motivation".

In the *performance* phase, athletes are actively involved in learning a task, observing their performance, and using strategies to facilitate the attainment of their goals. During this phase, an athlete uses strategies such as imagery, help seeking, self-instruction, and self-observation techniques such as self-recording. "When you record your training, it crosses the line between being casual or serious about the sport," says Roisin McGettigan, an Irish track-and-field athlete. She also stated: "I was able to track my progress, learn what worked and what didn't. I could figure out why I was tired and see if I over- or under- estimated my training." It is important to note that the effectiveness of these strategies depends on how well an athlete engages in self-observation.

The *self-reflection* phase involves processes that follow learning and/or performance efforts, for example self-judgment and self-reactions. Self-judgment refers to self-evaluation and attributions, while self-reactions are self-satisfaction/ affect or adaptive inferences (e.g., athletes engage in goal adjustment based on outcomes) and defensive inferences (e.g., athletes engage in procrastination or task avoidance). It is in this phase that athletes judge their performance and assign causes to their outcomes based on prior self-monitored data. For instance, a baseball pitcher, who is struggling with his command (e.g., consistently missing the strike zone) may reflect on his performance and attribute his failure to the mechanics of his delivery (e.g., the wind up, the leg kick) instead of internalizing the failures in terms of being "a bad pitcher". Self-

reflection phase processes, in turn, influence forethought phase processes. For example, if a volleyball player keeps failing to score on a serve, she may begin to doubt her serving capability and may feel the need to review her technique and engage in more practice episodes. This phase completes the self-regulatory cycle of learning and influences subsequent efforts to learn and perform (e.g., goal adjustment, strategy selection, etc.).

Self-regulated learning in sports can be summed up with a quote from Brittany Bowe, an American Olympic speed skater, who stated: "You have to be a student of the game to be successful, and it's promising when you can say that with a world-record performance, I still have things to improve on!" Indeed, *e*xpert athletes create self-oriented feedback loops to monitor the effectiveness of strategies and to adapt their functioning to maintain and improve performance outcomes.

Research on Self-Regulated Learning and Environmental Processes in Sport

There is extensive research evidence that athletes use a broad array of self-regulatory processes (Kitsantas & Kavussanu, 2011; Kitsantas & Zimmerman, 2002). In this section, we review pertinent research on the effectiveness of key self-regulatory processes across the three cyclical phases of self-regulated learning and performance, described in the previous section. We also review research on the role that the coach plays on athletes' self-regulatory functioning.

Forethought Phase Processes

Goal setting. Goal setting refers to identifying intended actions or outcomes. A number of studies have demonstrated that setting specific rather than general goals, short-term rather than long-term ones, and self-generated rather than assigned goals is more beneficial for learning and performance in sport (e.g., Kolovelonis, Goudas, Dermitzaki, & Kitsantas, 2013; Zimmerman & Kitsantas, 1998). In addition, moderately difficult rather than easy goals are the most effective goals in increasing achievement and motivation (Locke & Latham, 1990). Finally, process goals,

which require athletes to focus on the processes (steps) rather than the end result promote athlete attention to detail and produce better performance compared to outcome goals, which focus purely on the end result (Zimmerman & Kitsantas, 1996, 1997).

Premature focus on outcomes before a skill is fully mastered increases the cognitive complexity of a skill and has a negative impact on motivation (Zimmerman & Kitsantas, 1996, 1997). Effective learning and performance best occur when one initially concentrates on process goals, then switches to an outcome goal, when the task becomes automatic. For example, in an experimental study, where students were assigned to three experimental conditions (outcome goal, process goal, and a shifting process-outcome goal condition), participants who shifted from process to outcome goals, outperformed students who maintained their process goal after reaching automaticity. These findings suggest that athletes should use both process and outcome goals depending on their phase of learning (Kitsantas & Zimmerman, 1998; Zimmerman & Kitsantas, 1997).

Goal orientation. "The best motivation always comes from within" – Michael Johnson (Gold Medal Sprinter). Achievement goal orientation, a central construct in achievement goal theory (Ames, 1992; Dweck, 1996; Nicholls, 1989) has received a lot of research attention in relation to self-regulation in the athletic domain. Two major achievement goals operate in sport and involve variation in the definition of competence and the criteria one uses to evaluate success. The terms task, learning, and mastery have been used by Nicholls (1989), Dweck (1996), and Ames (1992), respectively, to refer to a goal in which an individual strives to *develop* competence and evaluates success using self-referenced criteria (e.g., learning, task mastery). The terms ego, performance, and ability have been used by these theorists to refer to a goal, where one strives to *demonstrate* competence and evaluates success using other-referenced criteria (e.g., winning).

Several studies have examined goal orientation in relation to self-regulation processes in physical activity contexts. Theodosiou and Papaioannou (2006) found that task orientation was a positive predictor of self-monitoring and evaluation, whereas ego orientation was unrelated to self-monitoring, in physical education students. Elite young athletes characterized by a high task/high ego profile, used imagery more often than those characterized by a low task/moderate ego and moderate task/low ego profile (Harwood, Cumming, & Hall, 2003); in a second sample of elite athletes, those in the high task/moderate ego group reported more frequent use of goal setting, self-talk, and imagery compared to the low task/high ego, and moderate task/low ego groups (Harwood, Cumming, & Fletcher, 2004). Finally, in an experiment involving undergraduate student athletes (Gamo-Overway, 2008), participants in the task-involving condition (i.e., focus on improving their reaction time), used collectively more self-regulation strategies (i.e., planning, monitoring, goal setting, task strategies, and self-evaluation) while performing a novel computer reaction-time task, compared to those in the ego-involving condition (i.e., focus on outperforming others). These results suggest that task orientation is the critical goal in influencing the use of self-regulatory processes in athletes, but a high ego goal may have complementary benefits.

More recently, researchers have examined whether achievement goals differ as a function of the context, namely *training* and *competition*. Organized training (i.e., training sessions under supervision of a coach) is central to athletes' sport lives, as this is the context, where they spend a vast amount of time to develop their skills, particularly at the elite level. Organized competition is an integral part of sport, which by nature involves social comparison. Several studies have shown that ego orientation is higher in competition than in training, whereas task orientation is more stable across the two contexts (van de Pol & Kavussanu, 2011, 2012; van de Pol, Kavussanu, & Ring, 2012a).

This line of research has also investigated the effect of context on the relationship between goal orientations and self-regulation strategies. In the first study to examine this issue, van de Pol and Kavussanu (2011) found that task orientation was positively related to goal setting and self-talk in both training and competition and attentional control in competition; ego orientation was unrelated to these strategies in either context. Task orientation was also positively associated with effort and perceived improvement in training as well as with perceived performance in competition. Finally, an interaction effect emerged, whereby ego orientation was linked to effort in competition, when athletes had low or average levels of task orientation. These findings suggest that athletes, who tend to evaluate success using self-referenced criteria, are more likely to use self-regulation strategies not only when they practice but also when they compete. These athletes are also more likely to try hard in both contexts. However, when athletes' task orientation is low or average, ego orientation may be beneficial for effort in the competition context.

In a recent experiment, van de Pol et al. (2012b) created training and competition conditions in the laboratory. Participants - tested in pairs - were told that the purpose of the (training) session was to learn and improve the skill of golf putting, were given instructions on how to put a golf ball, practiced six blocks of 10 putts each, and then, they performed 10 putts in a zero-sum competition condition. Zero-sum competition' involves a competition in which athletes compete against each other on a 'winner-take-all' basis, i.e. one person/team either wins or loses (Stanne, Johnson, & Johnson, 1999). Ego involvement increased and task involvement decreased as participants moved from training to competition. Although ego involvement positively predicted effort and enjoyment in both conditions, the effect of ego involvement on these variables was augmented, when task involvement was also high. Participants who scored higher in ego involvement performed better in competition. Thus, once a task has been mastered a motivational focus on an ego goal in competition may benefit performance.

Another line of research investigating the role of achievement goals on emotions has shed more light on the role of task and ego goals on achievement-related outcomes. In one study (Dewar & Kavussanu, 2011), golfers who reported being task involved, were more likely to also experience happiness and excitement, and less likely to feel dejection during a round of golf. In addition, when they perceived that they had performed poorly, the greater their ego involvement, the less happy, and more dejected they were. Thus, ego involvement could lead to negative emotions *when one performs poorly*. In a second study of team-sport athletes (Dewar & Kavussanu, 2012), ego involvement positively predicted hope when perceived performance was high and dejection when perceived performance was low. Task involvement was positively related to happiness, pride, and hope, and negatively related to dejection and shame. These results suggest that task involvement is a robust predictor of positive emotions, whereas the relationship between ego involvement and emotions depends on how athletes perceive they have performed.

The findings discussed in this section underline the significance of adopting a task goal when one learns and performs motor skills, as it appears to be the most adaptive goal facilitating a variety of self-regulation strategies and achievement-related outcomes. The overall findings pertaining to an ego achievement goal are somewhat more complex. A combination of high task and high ego seems to be the most beneficial goal profile to adopt in competition, particularly concerning effort and performance. However, ego orientation may predispose athletes to experience negative emotions when they do not perceive they performed well, which may influence their self-regulatory functioning.

Self-efficacy. Self-efficacy refers to “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p.3). There is extensive evidence that athletes' self-efficacy influences their motivation to initiate and sustain self-regulatory functioning. This construct influences many self-regulatory processes such as

goals, task strategies, and self-reactions. For example, athletes reporting high self-efficacy are more likely to set challenging goals and search for strategies that will help them accomplish these goals compared to those with low efficacy (Kitsantas & Zimmerman, 2002, 2006). Self-efficacy has also been linked to sports performance, with a moderate relationship reported in a meta-analysis of 45 studies (Moritz, Felz, Fahrbach, & Mack, 2000). More recently, Halper and Vancouver (2016) examined the effects of Division I college football players' self-efficacy beliefs on their squat performance, measured at three points in time. Multilevel analysis showed that athletes' self-efficacy was positively related to squat performance, both at between-person and within-person levels of analysis (while controlling for past performance). These findings provide evidence that athletes' self-efficacy is positively associated with their performance in sport.

Performance Phase Processes

Self-monitoring. A key process in the performance phase of self-regulation is self-monitoring, which refers to observing and tracking one's own performance. Self-recording, a form of self-monitoring, in sports can greatly assist self-monitoring because it can increase the proximity and accuracy of feedback (Zimmerman & Kitsantas, 1996, 1997). In a study of students initially learning to throw darts, participants who engaged in self-monitoring (e.g., kept records of their performance) were more successful in learning to throw darts and reported greater motivation than the groups who did not self-monitor (Zimmerman & Kitsantas, 1996).

There is evidence that highly self-regulated learners use self-recording more often than poorly self-regulated athletes. Kolovelonis et al. (2011) examined the effects of self-recording, along with goal types (process, performance, outcome, and multiple goals) with 105 fifth and sixth graders using a dart-throwing task. Self-recording had a positive effect on students' performance of a new skill. Using self-recording during practice allowed them to compare their own performance with their goals; however, self-recording had no effect on their satisfaction with

learning the new skill. Overall, these findings suggest that when teaching a sport skill, self-recording should be used as an aid to improve learning.

Adaptive help seeking. Adaptive help seeking involves approaching experts, such as coaches to request assistance with one's learning. It involves seeking specific assistance to correct flaws in one's performance and is limited in duration. Help seeking is an important part of the self-regulation process because the learner needs to determine whether help is necessary, decide whether to seek help, the type of help and from whom, and solicit, obtain and process whether the help received will enable them to achieve their goal (Karabenick & Dembo, 2011). A supportive social environment may allow leaners to seek help, knowing that a strategy can lead to success. Research related to athletes and help seeking is limited. However, evidence suggests (Durand-Bush & Salmela 2002) that Olympic and world championship athletes report that help is critical and they seek help not only from their primary sport coach, but from other professionals such strength and conditioning coaches, sport psychologists, athletic trainers, and nutritionists. Thus, help seeking is an important self-regulatory process and may have implications for athletic performance.

Self-Reflection Phase Processes

Self-evaluation. Self-evaluation refers to using standards to make self-judgments about one's performance. Athletes evaluate their performance based on standards from previous performances (e.g., comparing current with previous performance), mastery goals (use a sequence of steps that lead to the outcome), and performance of other competitors. Kitsantas and Zimmerman (2006) examined whether graphing performance in combination with self-evaluation influenced dart-throwing performance. They found that novice learners, who graphed their performance and evaluated their outcomes based on graduated or hierarchically set standards

significantly improved their dart-throwing skill and experienced more positive motivational beliefs than students, who did not graph and evaluate their outcomes on graduated standards.

Closely linked to self-evaluation are the attributions athletes make for their errors. Attributing errors to strategy deficiency sustains motivation when performance outcomes do not meet desired standards (Zimmerman & Kitsantas, 1997, 1999). Self-evaluative and attributional judgments lead to different types of self-reactions. Two forms of self-reactions have been explored: satisfaction and adaptive inferences, which direct athletes to sustain or change their self-regulatory processes, and defensive inferences, which may lead to apathy, procrastination, task avoidance. Highly self-regulated athletes make adaptive inferences, such as re-examining the effectiveness of their strategies, whereas poorly self-regulated individuals report defensive inferences, which serve primarily to protect them from future dissatisfaction (Zimmerman, 2000; Kitsantas & Zimmerman, 1998).

Research on Coaching Influences on Self-Regulated Learning

Self-Regulatory Training in Key Self-Regulatory Processes

Coaches can play a key role in supporting and promoting athletes' self-regulatory functioning. From a cyclical perspective of self-regulation (Kitsantas & Zimmerman, 2002; Zimmerman & Kitsantas, 1996, 1997), athletes acquire skills in four sequential levels: observation, emulation, self-control, and self-regulation (Zimmerman & Kitsantas, 2005). At the observational level, the coach models and describes a specific strategy that will assist the athlete to improve athletic skills. Then, the coach asks the athlete to *emulate* the model's strategy and provides him or her with corrective feedback and praise. Once the strategy related to a specific sports skill is mastered*, at the self-control level*, the coach slowly withdraws support and asks the athlete to practice on his or her own in a controlled setting using the strategy and process oriented standards. Finally, at the *self-regulated* level of skill acquisition, the athlete is asked to focus on

outcomes and adjust his or her performance as needed. At this level, an athlete's functioning continues to depend on the coach.

This multi-level model of self-regulation has been tested in many studies (e.g., Kitsantas, Zimmerman, & Cleary, 2000; Zimmerman & Kitsantas 1996, 1997). In a recent study with fifth and sixth grade students, Kolovelonis et al. (2013) used this model as a method for teaching basketball dribbling. Findings showed that students improved their basketball dribbling when they progressed through the levels of the model providing support for the use of the four-level model in developing novice learners' sport skills. However, we do not know whether the findings can be replicated in elite athletes using a longer intervention.

Research comparing expert, novice and non-expert athletes also provides evidence for how coaches can structure the learning environment to foster self-regulation. Cleary and Zimmerman (2001) found that expert basketball players displayed higher levels of self-efficacy, set more specific goals, used more process-oriented strategies, and attributed failure to strategy more so than did non-expert and novice athletes. Similar findings were revealed in a study of volleyball players (Kitsantas & Zimmerman, 2002). It may be that experts display higher levels of performance because they engage in more effective self-regulatory processes than non-experts and novices. Similarly, Walsh (2012) stressed that from a purely operational perspective, as athletes' skill level improves, the feedback and instruction should be pared down allowing them to master the exercise using more self-regulatory strategies.

Researchers have also investigated coaches' ability to assist their athletes in their self-regulatory processes. Collins and Durand-Bush (2014) implemented an intervention based on Zimmerman's social-cognitive model of self-regulation (Zimmerman, 2000) with one coach and one elite international curling team. The coach delivered eight 90-minute intervention sessions to his team along the themes of awareness, control and adaptation of behaviors and goals. Results

indicated that the coach used multiple strategies to assist the athlete with preparation for competition (forethought phase), such as intrinsic/autonomous goal setting and strategic planning. During the performance phase, coaches had much less influence on the athletes' self-regulatory skills, but they could help the athletes track their progress and give feedback and attention-focusing encouragement. In the self-reflection phase, the coach helped the athletes digest their statistical data, suggested corrective strategies, and guided them to finding solutions for issues that arose during performance. This study provides support for the role a coach can play in assisting their athletes using self-regulatory strategies.

Smith et al. (2010) asked regularly training athletes at the beginning of their season to select a personal sports goal to work toward and to indicate whether the goal was self-generated, whether they had a strategy to achieve it, the extent to which their coach supported their goals (i.e., was autonomy supportive versus controlling). Participants were retested at the mid-point and the end of their season. Athletes' perceptions of their coaches' support for their autonomy and participation in training decisions were positively associated with autonomous goal motives, whereas athletes, who perceived their coaches as controlling, also adopted controlled goal motives. The findings of this study suggest that coaches should avoid the use of controlling behavior such as reprimanding athletes for performing below the coach's expectations, as this could negatively affect the athletes' motivation. By nurturing the motivation of an athlete (e.g., by allowing some choice about the training, giving rationale for practice tasks, and giving clear, non-critical feedback) the coach can provide an environment that may have a favorable influence on athletes' motivation and performance.

Researchers also argue that what matters the most is the ability to strategically retune a goal (e.g., Smith & Ntoumanis, 2014). Smith and Ntoumanis (2014) examined the role of goal motives (i.e., autonomous or personal internal goals vs. controlled or external goals) in predicting

self-regulatory responses to unattainable goals in athletes. Goal motives could forecast how easy it is for the athlete to disengage from the sports goal and reengage in an alternative goal. This is important for an athlete when a goal becomes unattainable, as failure can be psychologically damaging to the athlete and their performance, if they are not able to disengage from this unattainable goal and reset a more realistic goal. Overall, the findings suggest that it is critically important to examine athletes' motives and behaviors when they have trouble meeting a goal. That is, coaches might facilitate awareness of the unachievable goal and help the athlete develop a strategy for disengaging from the goal and shifting to an alternative attainable goal.

Motivational climate. Motor learning and performance typically occur in group settings. In these settings, the coach or physical education teacher play a vital role in influencing participants' self-regulation and motivation. The main aspect of the coaching environment that has been examined in relation to self-regulatory processes and motivational beliefs is the motivational climate of the team. Motivational climate is a term coined by Ames (1992) to refer to the achievement goals that are salient in the achievement context and is created by significant others such as physical education teachers, coaches, and parents. These individuals structure the achievement context in a manner that conveys to participants the criteria for success through the evaluation procedures, the distribution of rewards, the type of feedback they provide, and other means. A mastery climate is evident when success is defined as individual progress, every person has an important role, and the focus is on skill improvement and development. A performance motivational climate is salient when success is defined in normative terms, the top athletes typically receive the most recognition from the coach, and the emphasis is on how one's ability compares to that of others (Ames, 1992).

Several studies have shown a clear link between mastery climate and use of self-regulatory strategies and intrinsic interest in physical education. Theodosiou and Papaioannou (2006) found

that mastery climate was positively related to self-monitoring and evaluation, while performance climate was unrelated to self-monitoring and was weakly related to evaluation. Ommundsen (2006) showed that mastery climate positively predicted meta-cognitive self-regulation, regulation of effort, and adaptive help seeking. The effects of mastery climate on help seeking were mediated fully by task orientation, while the effects on meta-cognitive strategies and effort regulation were partially mediated by this variable; this suggests that mastery climate may have positive effects on self-regulation in part because it enhances task orientation. Performance climate was a positive but weak predictor of meta-cognitive regulation. Finally, physical education students who perceived a mastery climate in their class were more likely to concentrate better in their physical education lesson (Papaioannou & Kouli, 1999).

Motivational climate has also been associated with adaptive motivational beliefs and affective reactions. Undergraduate university students enrolled in tennis classes, who perceived a high mastery climate in their class, reported significantly more intrinsic interest in the activity and exerted more effort compared to students who perceived a low mastery climate in their class (Kavussanu & Roberts, 1996). Interestingly, female – but not male – students who perceived a mastery climate in their class were more likely to report high self-efficacy. These females also had low perceptions of ability. Perhaps a mastery motivational climate is most beneficial for those individuals (i.e., females) who tend to doubt their physical ability (Kavussanu & Roberts, 1996).

Motivational climate has also been investigated separately in the contexts of training and competition. van de Pol et al. (2012a), asked football players to complete questionnaires measuring perceived motivational climate, effort, enjoyment, and tension in these two contexts. Participants who perceived a mastery motivational climate in their team reported more effort in training, and more enjoyment in training compared to competition. It is worth noting that both effort and enjoyment were higher in competition than in training, which may explain these

findings. That is, a mastery climate appears to be more beneficial during training, where athletes' enjoyment and effort are not as pronounced as they are in competition, making it even more important that coaches create a mastery climate in training. Performance climate was negatively associated with effort, and positively associated with tension, in both contexts.

A robust finding of the studies reviewed above is the positive link between mastery climate and self-regulation processes as well as motivational beliefs. This finding suggests that creating a teaching or coaching environment that focuses on individual learning and personal success could lead learners to set more effective goals, monitor and evaluate their performance, but also regulate their effort, seek help, and seek feedback to improve their skills. This climate may also lead to more satisfaction with performance and enjoyment of the activity and greater concentration. In contrast, performance climate does not have consistent effects on self-regulation.

Future Research Directions

In this chapter, we reviewed research emphasizing the importance of engaging athletes in self-regulated learning. We also discussed how self-regulatory functioning can vary from training to competition and the role of the coach in this process. In this section, we offer some directions for future research.

First, more research should be conducted on self-regulation in training and competition contexts. Goals represent an important aspect of self-regulation as they provide a clear picture of situation-specific strategies that individuals plan to use as well as the outcomes they seek to attain. Although recent research suggests that athletes may functionally adjust their goals in the context of training and competition (van de Pol, et al., 2012b), it may be valuable to examine this issue from a self-regulation perspective, and in particular, how contextual motivational processes can be integrated into the cyclical model as proposed by Zimmerman (2000).

Second, the integration of technology is exploding in sport, particularly in the area of self-monitoring (see Section II, 2018/this volume). Currently, athletes have the ability to monitor their physiology such as heart rate or maximum oxygen uptake through wearable apparel. They can measure their mental processes through applied biofeedback such as brain wave (quantitative EEG) measurement. And they can work on their motivation through apps on their phone. The integration of technology into the self-regulated learning platform is an area for future research.

Third, very few research studies have focused on coachers' self-regulatory functioning. Coaches can also employ self-regulation, and as they become aware of the impact self-regulated learning can have on performance, they can begin to apply this knowledge to their own coaching techniques and reflective processes. More research is needed in this area as the use of SRL processes in coaches may affect athletic performance. Finally, researchers could conduct qualitative studies to better understand self-regulatory processes that are specific to the context of sport, and based on these findings develop instruments to assess self-regulatory functioning in athletes.

Nurturing Athletes' Self-Regulation in Training and Competition: Implications for Practice

Rafael Nadal, after his first-round loss against Fernando Verdasco at the Australian Open 2016 stated: "Today I was not ready to compete the way that I was practicing, so not happy with that. That's it." Athletes continuously move between training and competition, and they may need to adapt their achievement goals to adapt to these contexts. A self-regulated athlete functionally adjusts his/her goals to these contextual affordances to obtain desirable outcomes such as skill improvement in training and performance in competition. Below, we present a practical example of how self-regulatory processes function when an elite tennis player moves from training to competition.

In training, the player may engage in the forethought phase; in this context, skill improvement is an objective typically desired and emphasized, for example coaches are likely to create a mastery motivational climate in training (van de Pol et al., 2012a). A self-regulated tennis player should be able to pick up these contextual cues (see Zimmerman, 2002) and may adopt a high task goal based on the self-motivational beliefs and knowledge that this goal may assist him in obtaining desirable outcomes. Adopting this goal may facilitate a feeling of competence when players improve, and this should result in sustained motivation, essential to cope with the large number of training hours required for realizing one's full potential.

These forethought processes should influence how the player engages in the performance phase, when the training actually starts. Assuming that the tennis player strives for skill improvement in training, the drills and exercises are performed by using self- monitoring and control strategies (e.g., self-talk and attentional focus), which should facilitate this objective. Once the training is completed, the player may engage in self-reflection, thus evaluate his or her performance and assign causal attributions to the outcomes. For example, if the player has endorsed predominantly a task goal in the forethought phase, he or she may positively evaluate skill improvement by attributing improvement to effort. This may lead to positive affect such as enjoyment and satisfaction in training (van de Pol & Kavussanu, 2011, 2012; van de Pol, et al., 2012a).

When an important match is coming up the tennis player needs to shift his or her motivational focus to a 'competition mind state'. In this context winning is important, as the competitive outcome determines his ranking and potential prize money. Thus, in the forethought phase, the player may adopt a more 'balanced goal profile': a task goal, which may help him/her to reach an optimal personal performance standard, *combined* with an ego goal, which may provide him/her just that extra effort to persist when faced with challenges during a tough match

(see van de Pol, et al., 2012b). When the match starts, the athlete engages in the performance phase where the task will be executed, and he/she may adjust his/her monitoring and control strategies to the desired goal(s). In this context, the player may focus less on technical (body movements) and more on tactical skills (ball placement), as this may benefit performance.

Finally, the match is finished and the athlete engages in the self-reflection phase where she or he evaluate his or her own performances and assign causal attributions to it based on the adopted (high task-high ego) goal profiles in this match. The player evaluates whether he or she reached optimal personal performance standards (task goal) but also reflects on the outcome (win or loss) of the match (ego goal). For example, if the match was lost the player would attribute this loss to a controllable but unstable factor (e.g., 'I lost because I didn't put enough effort in today's match") which may help to protect their self-efficacy beliefs for the next match. In preparation of the next competition the athlete will use the knowledge from the last match and make adjustments needed for the next training episode.

When an athlete is less adept at self-regulated learning, it becomes important for the coach/teacher to intervene. The ability of the coach to create an appropriate performance environment, stressing appropriate forethought, performance and self-reflective processes is critical. When athletes (learn to) effectively use these self-motivational beliefs and strategies across the two contexts this may contribute to a fulfillment of the innate need for mastery and satisfaction from competing against other athletes but also helps them to become more self-regulated learners and performers. In the end, this may lead to higher achievement standards in both training and competition but also to a more enjoyable and enduring sport participation. Kimiko-Date Krumm (2013) comments after becoming, at age of 42, the oldest winner of a women's-singles match in Australian Open History, "I love tennis. I like practice. I like games. I like the tour. I enjoy it a lot."

Coaches can also play an important role in nurturing athletes' self-regulation and maintaining their motivation. Coaches need to be aware of the importance of creating a mastery motivational climate, particularly in training, where general levels of effort and enjoyment are lower compared to competition (van de Pol & Kavussanu, 2012; van de Pol et al., 2012a, 2012b). By focusing on each individual athlete, emphasizing skill learning and development, and rewarding effort, coaches and physical education teachers can create an environment that is likely to maximize effort, enjoyment as well as the use of self-regulation strategies in physical activity contexts. Coaches also need to de-emphasize a performance motivational climate, particularly in training, as it has been associated with higher tension in athletes in this context (van de Pol et al., 2012a). Finally, assisting athletes in setting autonomous goals and re-engaging in realistic goals when the prospect of achieving their goals are weak, coaches can help athletes perform at the highest levels.

Conclusion

In conclusion, in this chapter we reviewed research on self-regulation in sport and physical education, and examined the role of coaches and teachers in fostering athletes' self-regulatory functioning. Research findings in physical education and sport settings show that self-regulation is consistently associated with high levels of performance. Creating a mastery motivational climate that encourages skill development and supports athletes' independence is likely to enhance their self-regulation, motivation, and ultimately performance.

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