

Self-Determination Theory: A Case Study of Evidence-Based Coaching

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The coach is central to the development of expertise in sport (Bloom, 1985) and is subsequently key to facilitating adaptive forms of motivation to enhance the quality of sport performance (Mallett & Hanrahan, 2004). In designing optimal training environments that are sensitive to the underlying motives of athletes, the coach requires an in-depth understanding of motivation. This paper reports on the application of self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000) to coaching elite athletes. Specifically, the application of SDT to designing an autonomy-supportive motivational climate is outlined, which was used in preparing Australia's two men's relay teams for the 2004 Olympic Games in Athens.

Ryan and Deci (2000) emphasized the importance of motivation in a number of occupations, including coaching. They stressed how motivation produces outcomes (cognitions, behaviors, and affect) and, therefore, understanding motivation is pivotal to initiating and maintaining others to act in various contexts, such as sport. Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000), which is a major social-cognitive theory of motivation, focuses on the social factors (e.g., coach behaviors) that influence the various forms of motivation through their influence on perceptions of self-determination (autonomy), competence, and relatedness. Hence, SDT underscores the role of the environment in fueling people's perceptions of the three fundamental psychological needs in contexts such as sport (Deci & Ryan, 1985).

Deci and Ryan (1985) argued that motivation is multidimensional and proposed a motivational continuum that reflects varying degrees of self-determination. At one end of the motivation continuum is intrinsic motivation, which is characterized by the highest levels of self-determination, and at the opposite end of the continuum is amotivation, which is characterized by the least amount of self-determination. On the motivation continuum between intrinsic motivation and amotivation are several forms of extrinsic motivation. These various forms of extrinsic motivation are differentiated by the degree to which they are considered self-determining. An understanding of the various conceptions of motivation is important in developing an appropriate motivational climate.

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In conceptualizing intrinsic motivation, several researchers have focused on the innate needs of self-determination or autonomy (e.g., deCharms, 1968; Deci, 1975). Intrinsically motivated behaviors involve a genuine interest and enjoyment in pursuing particular activities and are associated with the natural tendency to seek unique challenges, to explore and to learn (Deci & Ryan, 1985; Ryan & Deci, 2000). The perception of choice in the initiation and regulation of particular behaviors is considered to reflect an internal locus of causality (Deci & Ryan, 1985).

Within SDT there are two broad types of extrinsic motivation (EM), non-self-determined extrinsic motivation (Non-SDEM) and self-determined extrinsic motivation (SDEM). Non-SDEM comprises external and introjected regulation, and SDEM consists of identified and integrated regulation. Coercion and obligation characterize Non-SDEM (Ryan & Deci, 2000). Athletes undertake some training (e.g., hill sprints), which for many athletes is not inherently fun, and are coerced by their coaches to perform those aspects of training (external regulation). Alternatively, athletes might feel guilty if they do not complete the planned training but do the training to please their coaches (introjected regulation). This broad type of motivation lacks the perception of choice. In contrast, SDEM is concerned with a conscious valuing or acceptance of the training (Ryan & Deci, 2000). Athletes over time might come to the realization that hill sprint training will help them achieve their ultimate goal of performing well at the Olympics (identified regulation). They may even endorse the training as being consistent with their personal beliefs about health and fitness (integrated regulation). Over time, the source of motivation to undertake less enjoyable aspects of sport may move from non-SDEM to SDEM (Deci, Eghrari, Patrick, & Leone, 1994), which is an important form of adaptive motivation associated with many positive outcomes such as persistence in sport (Pelletier, Fortier, Vallerand, & Brière, 2001). That is, the athletes may internalize the regulation of what are perceived to be important training activities. This shift in motivation might take place because over time, athletes come to the realization that high achievement in international sport requires the athlete engagement in highly repetitive activities (Mallett & Hanrahan, 2004). Self-determined extrinsic motivation is similar to intrinsic motivation in that there is the perception of choice (autonomy).

Amotivation is associated with a lack of interest in an activity and may lead to decreased participation in that activity. Often athletes' amotivated state is associated with a reduced perception of competence in their environment (Vallerand, 2001).

For many athletes, coaches, and administrators, the principal goal in high performance sport is to win. High performance sport that focuses on winning and monetary rewards associated with winning has the potential to undermine self-determined forms of motivation and shift the locus of causality from internal to external. However, there are many factors in elite sport that may promote perceptions of competence, self-determination, and relatedness that, in turn, promote an internal locus of causality and subsequently self-determined forms of motivation (Deci & Ryan, 1985). The importance of promoting self-determined forms of motivation is underscored by research that has shown that self-determined forms of motivation, including SDEM, are linked to several important outcomes associated with sport participation. For example, people with higher levels of self-determined motivation, compared to nonself-determined motivation, perform at a higher level (Amiot, Gaudreau, & Blanchard, 2004; Beauchamp, Halliwell, Fournier, & Koestner, 1996),

have been found to persist longer (e.g., Pelletier et al., 2001), use positive coping strategies in stressful situations (Amiot et al., 2004), and invest more effort (e.g., Pelletier et al., 1995). Deci and Ryan (2002) reported a more detailed review of the extensive research examining the relationship between self-determined motivation and optimal human functioning. Hence it is not surprising that sport psychologists have advocated the promotion of self-determined forms of motivation (Vallerand, 2001).

The strong support in the literature for SDT in understanding motivation supports the utility of adopting this framework in the design of an adaptive motivational climate for athletes at all levels of participation (see Vallerand, 2001 for a review). This paper outlines the development of an autonomy-supportive motivational climate, based on the conceptual framework of SDT and the subsequent application of this knowledge and understanding to coaching Olympic track athletes.

Background

This paper was written from a coaching perspective, embracing evidence-based research in psychology. A key aim of this paper is to encourage sport psychologists to work directly with coaches to design motivational climates that are autonomy-supportive which, in turn, have the potential to enhance the quality of sport performance. An autonomy-supportive environment is one in which satisfaction of athletes' needs for self-determination, competence, and relatedness are facilitated.

This paper reports how I, a qualified coach and sport psychologist, integrated knowledge and understanding from theory, research, and experiential learning in developing my professional practice and specifically how the motivational climate in preparing Australia's two men's relay teams for Athens was developed using the conceptual framework of SDT. Specifically, in this paper I will articulate my approach to coaching elite athletes, which has developed from my interrelated experiences in physical education teaching, sport psychology research and practice, and importantly from coaching the Australian senior relay teams at six major international championships since 1994. The application of this knowledge and understanding of SDT was central in the design of the motivational climate in preparing the Australian men's 4 × 100m and 4 × 400m relay teams for the 27th Olympic Games in Athens in 2004.

Developing an Autonomy-Supportive Coaching Environment

Research on expert athletes has repeatedly shown that talent development is dependent upon quality coaching (Bloom, 1985; Côté, Baker, & Abernethy, 2003). Although the coach's influence will vary across cultures, sports, and stages of talent development (Bloom, 1985; Salmela & Moraes, 2003), guidance from a competent coach is essential to becoming an expert performer. Given the key role of the coach, the development of a coach-athlete environment that nurtures the satisfaction of the three psychological needs of humans (SDT) is within the responsibilities of the coach.

It is important here to clarify what Mageau and Vallerand (2003) defined as autonomy support and the subsequent defining features of an autonomy-supportive

coaching climate. They drew on several definitions from the self-determination literature to provide a broader understanding of autonomy support, which is more than simply providing choice. Mageau and Vallerand argued that coaches (people with power) should display a number of behaviors that are consistent with an autonomy-supportive coaching climate: (a) behaviors that acknowledge and respect an athlete's perspective and feelings; (b) the provision of opportunities for athletes to choose; (c) the limited use of controlling behaviors; and (d) the valuing of initiative, independent problem-solving and involvement in decision making in preference to controlling athletes to think, feel, and behave a certain way. Mageau and Vallerand (2003) proposed that a single coaching behavior cannot encapsulate the broader understanding of autonomy-support, but requires the demonstration of a more complex set of coaching behaviors.

Mageau and Vallerand (2003) proposed a motivational model of the coach-athlete relationship, which focuses on the autonomy-supportive behaviors of the coach. The model is based on the tenets of SDT and seeks to promote perceptions of autonomy, competence, and relatedness. The model supports the demonstration of a complex range of behaviors (i.e., a pedagogical approach) aimed at satisfying the three psychological needs of athletes. The model proposes three major determinants of autonomy-supportive coaching behaviors, namely, the coach's personal orientation (controlling versus autonomy-supportive), coaching context (pressure to perform, e.g., elite sport), and perceptions of the athlete's behavior and motivation. The motivational model of the coach-athlete relationship proposes that the coach's autonomy-supportive behaviors impact upon the athlete's needs for autonomy, competence, and relatedness, which, in turn, promotes self-determined motivation (Mageau & Vallerand, 2003).

In developing an autonomy-supportive motivational climate, Mageau and Vallerand (2003) proposed seven autonomy-supportive behaviors that coaches could employ: (a) provide choice to athletes with some boundaries, for example, allow athletes to choose between two to three options in solving a task; (b) provide a rationale for tasks (i.e., explain the advantages and disadvantages of a particular option regarding training and in doing so provide the athletes with an understanding of why a particular course of action might be preferable); (c) acknowledge the feelings and perspectives of others—demonstrate the capacity to seek and respect alternative viewpoints; (d) provide athletes with opportunities for initiative taking and independent work (e.g., allow athletes to work independently and to suggest ideas to resolve problems); (e) provide competence feedback that does not control or direct behavior (i.e., constructive or informational feedback that contributes to a change in behavior because it allows the coach and athlete to freely discuss problems and potential solutions); (f) avoid coaching behaviors that seek to control the athletes (i.e., avoid coercion and bullying); and (g) reduce the perception of ego-involvement in competitive sporting environments. In developing an autonomy-supportive coach-athlete relationship, a pattern of coaching behaviors that is consistent with the above guidelines are underscored.

My in-depth understanding of SDT through research and related coaching practice was the genesis for developing the motivational climate over the two-year preparation of the two men's relay teams for Athens. However, not surprisingly, the guiding autonomy-supportive behaviors proposed by Mageau and Vallerand (2003), which are based on the tenets of SDT, are consistent with the coaching

practices that I adopted in preparing the relay teams and hence provide a useful framework for outlining the approach taken.

Coaching Practice: Athens 2004

From personal experience, coaching an elite athlete is not a simple process, let alone coaching six athletes who form each relay team and who have personal coaches, often with contrary views on the process of coaching. Thus the coaching of relays in national teams is understandably complex and problematic and subsequently challenging. One of the issues confronting the coaching of relay teams is the reluctance of the athletes to work together to achieve a common goal (e.g., successful relay performance). Many sprint athletes are more interested in their individual performance than the performance of the team and do not take kindly to activities that might be perceived as interfering with individual performance. My previous experiences in coaching national relay teams taught me that athletes do not appreciate being told what to do because they perceive that approach as undermining their own performance. An autocratic or controlling leadership style has the potential to alienate athletes and coaches, causing problems for the effective functioning of the coach-athlete relationship. Promoting a healthy coach-athlete relationship is posited as key to high quality sport performance and positive affective outcomes. In the following case study, the two Australian relay teams who competed in the Athens Olympic Games were coached using an autonomy-supportive approach consistent with that advocated by Mageau and Vallerand (2003).

I had been a regular team coach for the national relay teams for the past ten years and was the team coach for the two relay teams in Paris (2003 World Championships) and Athens (2004). Three of the six sprinters in the Athens 4 × 100 m team and five of the six sprinters in the Athens 4 × 400 m team competed in Paris (2003), suggesting some stability over the two-year period I coached the two teams. The two relay teams were coached separately and treated as two distinct groups.

There is some difficulty in verbally expressing the tone of the environment that was created in this case study; however, the following examples will provide some insights into how an autonomy-supportive coaching environment was promoted. It is noteworthy that the autonomy-supportive environment evolved over a two-year period with this group of athletes, but the focus in this paper is on the latter stages of preparation after final selection of squad members for Athens was made in early April 2004 (i.e., five months). Over the two-year period, a number of opportunities were used to create an autonomy-supportive coaching environment, including relay squad meetings involving personal coaches and athletes, relay-specific camps, and base camps in Australia and Europe prior to the major championships. The examples presented below tend to reflect an overall pedagogical approach to coaching rather than a set of disconnected coaching behaviors and consequently, the examples will encapsulate several coaching behaviors recommended by Mageau and Vallerand (2003). An antecedent to adopting autonomy-supportive coaching behaviors is the predispositional orientation of the coach that is congruent with that approach to coaching (Mageau & Vallerand, 2003). I was, and remain, oriented toward an autonomy-supportive approach to coaching, which is understandable in light of my background as a sport psychologist and pedagogue.

The relay athletes were provided choice in a number of management and performance areas. For example, decisions on training content, training times, training venues, and uniforms for training and competition were negotiated. One of the challenges for a relay team coach is balancing the training schedule designed by the individual coaches (speed development) with the requirements for relay team training (relay skills and tactics). Importantly, the perception that the relay work has the potential to compromise the quality of work required by the personal coach is a major issue; however, the training content required for both speed development and relay specific work need not be mutually exclusive. For example, athletes were provided with a training regime in the 4-6 week preparation period prior to Athens, which accommodated the individual training requirements of all athletes. Importantly, the personal coaches and athletes were involved in the process of developing that training schedule. The use of formal and informal team meetings was an effective forum for negotiating the training.

Another example that demonstrated how athletes might be provided with the perception of choice, was the approach taken with the Men's 4 × 400 m team in deciding the final running order for the Olympic final. In the semi-final the team had not performed as well as expected, although they had run a time consistent with their season's best. The fourth leg runner in the semi-final had performed under expectations, based on time trials the previous week and other data. In a team meeting, conducted after the semi-final, there were two decisions to be made. The first was the composition of the team, and the second decision was the running order for the final. I made the first decision, for which a sound rationale was provided, and then proceeded to outline the pros and cons of two preferred running orders, after which the athletes were given 15 minutes to discuss then decide upon their preference for the running order. It was imperative that the athletes were provided with the necessary information about the possible options available to make a meaningful decision (Deci, 1975). That process was important in shifting the responsibility back to the athletes thus promoting the perception of choice (self-determination). The decision to allow the athletes some meaningful choice in the decision making was important to me. It was crucial that the athletes had some autonomy in the decision because under those conditions, they were more likely to commit to their decision rather than to a decision imposed upon them. Had I as coach made the decision, it was possible that full commitment from the athletes (and personal coaches) to the same decision might not have resulted. A reduced commitment to the decided plan of action has the potential to undermine the performance of the team because one or more athletes or personal coaches may react negatively to a decision imposed upon the team. The athletes did not question the strategy post the decision, and from my observation of the athletes and from that reported from the personal coaches and team coaches, the athletes displayed every confidence in the strategy prior to the final. From my experiences as a relay coach, it is not unusual for athletes to individually discuss such things with coaches outside of formal team meetings. The important thing was for the athletes to commit to their decision and believe in that decision. The decision proved successful in that the fourth leg runner, who ran in second position in the final, improved 1.60 s on his performance in the semi-final. Although a cause-effect relationship between the perception of choice and the performance of the team in the final cannot be argued, it is suggested that the strategy did promote perceptions of self-determined competence which, in

turn, had the potential to enhance performance. That contention was supported by the observation that the athletes shared their confidence in each other to execute the strategy well during and post the formal meeting. A social environment that promotes a perception of personal choice is likely to promote self-determined motivation (Ryan & Deci, 2000).

Through the use of formal team meetings, the rationale behind rejecting a couple of traditional approaches to preparing relay teams for major championships were communicated to athletes and their personal coaches. This strategy was consistent with Mageau and Vallerand's (2003) second guideline, provide a rationale for tasks. For example, the cultural practice of training camps that focused on both sprinting and relay training were replaced with camps and competitions focused solely on relay training and relay competitions. This decision to focus solely on relays and not compete in individual events (e.g., 100 m) removed further opportunities for athletes to produce individual event qualifying performances for Athens. The rationale for focusing solely on relays at specified competitions was to remove inherent conflicts of interest (e.g., preference for the individual event as opposed to the relay event, which is the norm). After discussion of the benefits and costs of the approach, it was endorsed by the athletes and their coaches. Another example that was consistent with Mageau and Vallerand's second guideline was the provision of the rationale behind the decision to prepare the athletes with the primary focus on training as a group away from competitions rather than limited training combined with several competitions, as was the cultural practice. The travel involved in seeking appropriate levels of competitions was extensive and at the expense of potentially high quality training as a group. Again, that decision was considered by all stakeholders to be in the best interest of producing the best performance in Athens.

Although it is difficult to articulate how other people's feelings and perspectives were acknowledged, I actively sought suggestions, opinions, and feedback from athletes and their personal coaches. An example, which supports the demonstration of that coaching behavior, was the use of video analysis of the Australian 4 × 400 m team's performance at the 2003 World Championships in Paris during which the athletes reviewed the performances of several teams. In contrast to a common method of communicating directly an evaluation of the various teams' performances (reproductive pedagogy; Mosston & Ashworth, 1994), I strategically facilitated the learning (productive pedagogy; Mosston & Ashworth, 1994). This facilitation was achieved through a problem solving approach to instruction and learning (Mosston & Ashworth, 1994), which guided the athletes toward several options through divergent questioning. In the process of promoting divergent thinking, the opinions, suggestions, and thoughts of individual athletes were respected and valued. This pedagogical strategy was consistent with an athlete-centered approach to coaching. The promotion of an athlete-centered coaching approach rather than a coach-centered approach is consistent with an autonomy-supportive coaching climate. In an athlete-centered approach, the focus is on the learner and learning and not the coach and coaching (coach-centered approach). In an athlete-centered approach, the coach plays a facilitative role in the athletes' construction of knowledge. Approaches to teaching (coaching) that facilitate student-centered (athlete-centered) decision making (Mosston & Ashworth, 1994) are more likely to promote adaptive motivational climates (Goudas, Biddle, Fox, & Underwood,

1995; Mandigo & Holt, 2000). Anecdotal feedback from the athletes after the video analysis session was positive. Specifically, the athletes verbally reported that the session was useful in learning race strategies and that they valued the learning experience. In terms of SDT, the learning experience sought to satisfy all three psychological needs. The group activity promoted a sense of tribalism (i.e., relatedness) as the athletes constructively examined previous performances and subsequently worked together to problem solve in developing appropriate race tactics; they made team decisions after healthy discussion of the available options. The activity also assisted the athletes develop some confidence in knowing what strategy options were available in what situations, preparing them for the impending Olympic games. According to SDT, self-determined motivation will only be enhanced if feelings of competence are accompanied by a sense of choice, that is, the need for “self-determined competence” (Deci & Ryan, 1985, p. 32). The development of race options (tactics) by the team also promoted the freedom of choice in seeking solutions to potential race situations rather than being dictated as to what strategies to use in what situations. I used a more democratic leadership style in the above situation as a way to satisfy the athletes’ needs for autonomy. Overall, these types of learning experiences, which actively engage the athletes in their own learning, have the opportunity to enhance the perception that the athletes have some personal and meaningful choice in their learning, promoting an internal locus of causality (self-determination) as well as enhanced perceptions of competence and a sense of belonging (relatedness).

Three defining features of an autonomy-supportive coach-athlete environment are the provision for initiative taking and independent work, provision of noncontrolling feedback, as well as avoidance of controlling behaviors (Mageau & Vallerand, 2003). In the construction of the training environment, the athletes were strongly encouraged to take personal responsibility for learning the essential relay skills by specifically promoting opportunities for independent work and initiative taking. However, a specific example that integrated all three coaching behaviors was the design of the training environment to develop the skill of exchanging the baton at competition speed. In the process of learning the baton exchange, the athletes’ perceptions of autonomy were foregrounded. For each exchange, the following protocol was established. The two athletes executing the exchange would perform the skill. In providing feedback, the first source of feedback came from the two athletes executing the exchange. That feedback, which considered both the strengths and weaknesses of the performance, was followed by feedback provided by the other members of the team who had positioned themselves in various places to observe different aspects of the performance. The feedback was then compared to the feedback received from the videos, which the human eye is incapable of collecting. Constructive or informational feedback that seeks to promote perceptions of competence will enhance self-determination (Deci & Ryan, 1985). The feedback that was provided was informational (noncontrolling) because it was focused on the athletes’ problem solving (athlete-centered) that, in turn, was believed to promote perceptions of autonomy. In those training sessions, the athletes took initiative and worked both independently and interdependently to problem solve and they responded well to that authentic challenge. My role as coach was decentralized, reducing the potential for controlling behaviors and promoting

perceptions of autonomy. The process also encouraged the team to work together facilitating perceptions of relatedness.

Comparisons of feedback from human sources with the information from videos allowed athletes to develop their ability to correctly identify what they thought they performed with what they actually did. I gave feedback sparingly and only after all other sources of feedback were provided. The comparative analysis dimension of the training sessions shifted the responsibility for learning from the coach to the athlete, supporting an athlete-centered approach to coaching rather than a coach-centered approach, which is typically characterized by controlling behaviors. The comprehensive feedback, which sought to enhance their perceptions of competence, was complemented with an autonomy-supportive coaching environment. Questions from the coach were facilitative: “What were the advantages and disadvantages of that decision?” and “What was another option in that scenario?” The various questions provided the athletes with opportunities to think more critically about their event and brought to the fore how much they actually knew about their event and how in previous competitions they had often made appropriate decisions. The questions were also the catalyst for consideration of alternative strategies, aimed at increasing the confidence of the athletes’ decision making during a race. Consistent with SDT, feedback that provides information about competence, which is accompanied by a sense of choice, (i.e., self-determined competence; Deci & Ryan, 1985) will promote self-determined motivation.

Self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000) underscores the importance of a motivational climate that is conducive to people perceiving themselves as competent. The previously mentioned approach to providing feedback at the baton exchange practices was complemented with other sources of noncontrolling competence feedback. Both relay teams were provided with extensive data about their own performances in training and competition, which promoted a process rather than an outcome focus. In addition, both teams were provided with comprehensive performance targets that were process-focused. For example, the 4×100 m team members were provided data about their times in exchanging the baton through the 20 m zone in addition to times for the first and second 200 m of the 4×100 m. The athletes were able to self-reference their personal target times with their performance times. That approach provided the athletes with a real sense of achievement when they were able to produce the target time in both training and competition, which, in turn, promoted perceptions of competence (Deci & Ryan, 1985). On the occasions when the athletes did not produce the required times, as a group they demonstrated the capacity to search for reasons and potential solutions working interdependently and subsequently promoting the sense of relatedness. No specific strategies addressing relatedness singularly were developed. Rather the approach taken was to design an environment in which the athletes were encouraged to work together to problem solve in a positive, supportive learning environment. Subgroups (each pairing of athletes working on a particular exchange) within the team as well as the team overall were provided opportunities to develop task cohesion. The collective approach to problem solving, the sharing of ideas between the athletes, and involving the athletes in decision making were some of the strategies that were considered successful in satisfying the need for

relatedness. The athletes, including the athletes who did not run, were encouraged to see themselves as an integral part of the team.

Evaluation of Approach

Did the approach succeed? Ideally, it would have been great to have measures of self-determination, perceived competence, relatedness before and after intervention, and a comparison with a control group, but that was not possible. Hence, I report feedback from some objective measures of performance and a personal and subjective assessment of the approach that cannot infer causality between the approach taken and its impact on the quality of performance.

Self-determined motivation has been linked to performance (Amiot et al., 2004; Beauchamp et al., 1996) and although causality cannot be inferred from this intervention, the following data show that the two relay teams performed optimally in Athens in a highly contested environment in which few teams produced optimal results. For the purposes of this paper, the performances can be partially evaluated using both self-referencing and norm-referencing measures. In terms of self- and norm-referencing criteria, performances were evaluated for both teams as successful and close to optimal. Bales and Henwood (2004) in analyzing the results from Athens highlighted the intense pressures associated with competing in the Olympic Games:

It is important to recognize that the demands on athletes have become incredibly intense. Competitors are pushing themselves to such an extreme that the smallest mistake can eliminate even the best-prepared athlete. Of the 301 World Champions from 2003 . . . almost half of them (46%) were shut out of the medals. (p. 7)

In light of that context, the following comments are advanced regarding the performance of these teams in Athens.

The men's 4 × 100 m ran faster than their previous season best time of 38.66 s (recorded five weeks before Athens) in recording times of 38.49 s and 38.56 s in the semi-final and final, respectively, in Athens. Their next best time that season was 39.05 s recorded four months before Athens. In Olympic sprinting mere hundreds of seconds separate teams. For example, there was 0.19 s separating 4th to 8th places in the men's 4 × 100 m final in Athens (approx. 1.5 m). Additionally, few athletes or teams produce personal best performances at the Olympics. In light of the fact that in track and field, only 24% of athletes produced the performance in the Olympics that they achieved in qualifications (Bidder, 2005), the achievement of the men's 4 × 100 m relay team was significant. Thus, it is rare for athletes and teams to produce season best performances in Olympic competition. Moreover, Radford and Ward-Smith (2003) reported that approximately 25% of 4 × 100 m relay teams at major international championships (1995, 1997, 1999, 2001) were disqualified or failed to finish.

The target time for the 4 × 100 m team was 38.40 s to 38.60 s. Not only was the target time achieved on two occasions during the games, but adjusting for bend-curvature effects (accounting for the disadvantage of inside lanes) the team produced performances that were 99.5% (semi-final) and 99.9% (final) of the optimal times predicted based on the mathematical models proposed by Ward-Smith and Radford

(2002). The team ran in lane six in the semifinal and in lane one in the final. The team's target time of 38.40 s to 38.60 s was both reasonable and arguably achieved on the adjusted times based on lanes (Ward-Smith & Radford, 2002).

However, in elite sport, teams are generally evaluated using a single norm-referenced criterion (i.e., performance outcome). The team was ranked 14th coming into the competition and finished in sixth place beating more fancied rivals with superior individual sprinting performances (e.g., Jamaica, Canada, Trinidad, & Tobago, Germany). In summary, I argue that the team performed well using both self- and norm-referenced criteria.

In my evaluation of the achievement of the men's 4 × 400 m team, they were successful on both self- and norm-referencing criteria. The team ran 3:00.6 in the final, faster than their previous season best time (3:02.93) and what they ran in the Olympic semi-final (3:03.06). They achieved their team target of 3:00.5 to 3:01.0 improving from their 13th place ranking prior to Athens. The team finished in 2nd place in the final after beating several more fancied rivals (e.g., Great Britain and Northern Ireland, Germany, Jamaica, and Nigeria). In summary, the two men's relay teams produced very successful results in Athens.

The Olympic Games is a stressful competitive environment, and strategic attempts to reduce "potential barriers" to the quality of performance is a common goal for coaches and sport psychologists. From my perspective as the coach (and as a sport psychologist), the approach adopted in preparing the two men's relay teams was successful. In comparison with the preparation of other national relay teams I have coached, the athletes in these teams were characterized by an enthusiasm to pursue excellence, a positive and self-efficacious attitude, and a willingness to work together to achieve the best result possible in Athens. That is, there were observable positive behavioral and affective outcomes that were considered attributable at least in part to the autonomy-supportive approach. There was little dissent and a general aura of respect and trust among the athletes, personal coaches, and myself. The level of cooperation in this campaign was higher than previously experienced and although a similar environment was promoted in 2003, I propose that it takes time to develop a high level of understanding of an autonomy-supportive coaching environment. Athletes who are unaccustomed to an autonomy-supportive coaching environment might find the increased freedom initially challenging. Asking athletes who are familiar with a controlling coaching environment questions about their performance and how they might improve their performance is so unique that it takes time for them to feel confident to offer their opinion. The development of trust and respect between coach and athletes takes time. I am also confident that the benefits of an autonomy-supportive coaching environment are accumulative and that some of the preparatory work conducted in 2003 using that approach contributed to the success of the coaching climate developed in 2004.

I believe that athletes' ability to display highly competent relay skills in the cauldron of Olympic competition positively reflected their ability to cope with the emotional demands of the competition. I also believe they demonstrated the capacity to work together. There was little evidence of high levels of anxiety, but a sense of personal ownership, self-sufficiency, efficacy, and feeling that they were a part of a competent team (interdependency) who had prepared well for arguably the most important event of their sporting life. The athletes contributed freely to their own learning and were rewarded with positive influences on satisfaction of the three

psychological needs, perceptions of autonomy, competence, and relatedness.

The atmosphere that was created in the preparation of the two relay teams for Athens was consistent with SDT and the autonomy-supportive coaching behaviors proposed by Mageau and Vallerand (2003). The motivational approach focused on the centrality of the athlete rather than the coach, which it is argued promotes opportunities for high quality sport performance. If coaches design motivational climates that promote satisfaction of the three human needs—autonomy, perception of competence, relatedness—they can develop a positive learning environment that is conducive to enhancing the benefits of quality sport participation.

Conclusions

A major purpose of research-based theory and applied research in sport psychology is to enhance performance and the quality of sport participation. The utility of adopting an approach to coaching on sound research in preference to adopting traditional cultural coaching practices has great merit. The employment of an autonomy-supportive environment was found to be intrinsically rewarding to me as a coach and sport psychologist who is oriented toward that form of social interaction. Cause-effect relationships cannot be established in an autonomy-supportive pedagogical approach to coaching athletes in stressful ego-involved environments such as the Olympic Games. However, an autonomy-supportive coaching approach may promote an adaptive environment in which athletes can both enjoy their participation as well as seek optimal performance. As stated earlier in the introduction, the primary aim of this paper is to encourage sport psychologists to work directly with coaches in the facilitation of an autonomy-supportive motivational climate with the purpose of enhancing the quality of sport performance, and hopefully this paper will contribute to that increased interaction.

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