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1   **Interplay of Motivation and Self-Regulation throughout the Development of Elite**

2   **Athletes**

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1   **Abstract**

2   Recent development in the understanding of human motivation has highlighted the crucial and

3   reciprocal role of motivation on cognitive processes (Baumeister, 2016; Englert and Bertrams,

4   2015; Jordalen, Lemyre, and Durand-Bush, 2016). In elite sport settings, athletes are subject

5   to external forces that do not necessarily correspond with their inherent drives (Gustafsson et

6   al., 2017; Kim, Reeve, and Bong, 2017). However, they seem to develop cognitive

7   competencies to cope with external forces, when planning, monitoring, and reflecting on their

8   high-level achievements (Bartulovic, Young, and Baker, 2017). The current study aims to

9   explore likely interactions between motivation and cognitive processes as athletes develop

10   from novice to elite levels. Five female Olympic and World Championship medallists were

11   interviewed. A thematic analysis revealed how motivation and self-regulation competencies

12   interchangeably influenced athletes' career trajectories asynchronously. Chronologically, four

13   themes emerged: 1) Motivational shifts evoked planning and self-control competencies, 2)

14   The external control constrained athletes' self-regulation, 3) Self-control and reflection in

15   extrinsically driven athletes, and 4) Elite athletes' multidimensional motivation and self-

16   regulation profile. Initially, intrinsic motivation prompted athletes' participation, but the

17   competitive nature of sport activities led to a shift toward more external forms of motivation.

18   This motivational shift was accompanied by changes in self-regulation competencies,

19   particularly planning and self-control, rather than self-reflection. Over time, athletes'

20   increased sport-specific self-confidence contributed to further refinement of self-regulation

21   competencies and integrated motivational regulations. Rather than exploring motivation and

22   cognitive competencies individually, current study findings highlight dynamic interactions

23   between these concepts that influences athletes' ongoing development to elite level

24   performances.

1   Keywords: elite athletes' career trajectory; external control; intrinsic motivation; motivation

2   regulations; self-control; self-regulation competencies

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1   **Introduction**

2   In elite sport settings, athletes are subject to external forces—results, scholarships, and

3   social (dis)approval (Gustafsson et al., 2017; Martinent and Decret, 2015). These external

4   forces could be in conflict with athletes' inherent drives causing less autonomous motivation

5   (Kim et al., 2017; Ryan and Deci, 2000), and perceptions of the motivational climate may

6   strongly influence performances and development (Bartholomew, Ntoumanis, and Thøgersen-

7   Ntoumani, 2009; Pensgaard and Roberts, 2002). Therefore, motivation theories need to

8   increase the understanding of how athletes select and control actions influenced by

9   motivational forces, even when they oppose inherent desires (Kim et al., 2017). For example,

10 does athletes' development in performance contexts include improved competencies to cope

11 with motivational forces through self-regulation processes such as self-generated thoughts,

12 feelings, and actions developed for the attainment of personal goals (Zimmerman, 2006)?

13 Participation in sport provides young athletes with opportunities to learn key self-regulation

14 competencies such as strategic planning and self-reflection (e.g., Jonker et al., 2012). These

15 competencies may enhance the quality and quantity of motivation (Deci and Ryan, 1985;

16 Gillet et al., 2012). However, athletes' motivation is complex, multifaceted, dynamic, and may

17 shift over time (Lemyre, Treasure, and Roberts, 2006), and researchers interested in

18 motivation theories have recognized the crucial role of cognition (i.e., self-regulation) in

19 motivation (Baumeister, 2016; Kim et al., 2017).

20   The development of self-regulation competencies requires effort and focus, and

21 athletes' awareness of their own thinking processes is important, particularly to determine

22 when it is necessary to alter responses to meet changing personal or external standards of

23 performance (Zimmerman, 2002). By interacting with significant others who nurture their

24 independent regulation, athletes' self-regulation is facilitated through co-regulation (Collins

25 and Durand-Bush, 2014). For example, coaches may help athletes prepare for obstacles in

1   front of performances, letting go of mistakes as they perform, and attributing errors to sources

2   they control. Motivational forces stimulating these attempts to self-regulate arguably impact

3   long-term engagement and reflect the achievement of expected outcomes (Baumeister and

4   Vohs, 2007; Englert and Bertram, 2015b; Inzlicht and Schmeichel, 2012). Studies explicitly

5   examining the link between motivation and self-regulation efforts over time, particularly from

6   a qualitative perspective, are scarce. Some quantitative studies have demonstrated that self-

7   determined types of motivation were positively associated, while controlled types of

8   motivation were negatively associated with self-control in young athletes (e.g., Englert and

9   Bertrams, 2015; Jordalen et al., 2016). Moreover, the interplay between motivation and self-

10   control further predicted decreased (i.e., when motivation was self-determined) and increased

11   (i.e., when motivation was controlled) levels of exhaustion (Jordalen et al., 2016). However,

12   these studies did not consider self-regulation across athletes' career and potential concurrent

13   fluctuations in their motivation. The purpose of the current study was to retrospectively

14   investigate elite athletes' subjective experiences of motivation and self-regulation throughout

15   their career. With the aim of investigating this connection, this study combined the self-

16   determination theory of motivation (SDT; Deci and Ryan, 1985; Ryan and Deci, 2000), and

17   social cognitive (Zimmerman, 1989, 2006) and self-control (Baumeister and Vohs, 2016;

18   Baumeister, Vohs, and Tice, 2007) models of self-regulation.

19   ***Theoretical Framework***

20   Motivation is proposed as a fundamental human driving force (Ryan and Deci, 2000),

21   served by cognitive competencies such as planning and self-control (Baumeister, 2016).

22   According to Ryan and Deci, there are six types of motivational regulations, each having

23   different characteristics, antecedents, and consequences. Broadly, these regulations are

24   marked by autonomous and controlled types of motivation, and are positioned along a self-

25   determination continuum, ranging from intrinsic regulation, four types of extrinsic regulations

1   (i.e., integrated, identified, introjected, and external), to amotivation (Ryan and Deci, 2000).

2   The three former self-determined regulations are characterized by, for example, inherent

3   interest and enjoyment in an activity, personal reasons for engaging in an activity, and

4   personal importance attached to the outcome of an activity, respectively. The latter three

5   regulations are more externally controlled, typified, for example, by self- and other's

6   approval, external demands, and no intentions or values, respectively. Further, individuals

7   may internalize and integrate these externally controlled regulations, hence possess greater

8   maintenance and quality of engagement (Ryan and Deci, 2000). Within SDT, human beings

9   are viewed as inherently active, and the various types of motivation drive humans—thus

10   athletes—throughout their development (Deci and Ryan, 1985). For instance, autonomy-

11   supportive and controlling environments impact the intrinsic motivation and cognitive

12   functioning of athletes (Bartholomew et al., 2009; Baumeister and Vohs, 2016; Englert and

13   Bertrams, 2015).

14   Self-control and self-regulation competencies are key cognitive features of a healthy

15   and productive life, guiding motivational desires and providing individuals with opportunities

16   for success (Baumeister, 2016; Mischel, 2014). The concepts of self-control and self-

17   regulation have been used interchangeably, although self-control has been conceptualized as a

18   deliberate, conscious, and effortful subset of self-regulation (Baumeister et al., 2007). When

19   athletes are successful in their self-control efforts, they wait for gratification rather than

20   choosing immediate rewards (Mischel, 2014). As such, self-control is crucial for successful

21   long-term goal attainment, and is dependent on quality motivation to overcome setbacks. That

22   is, the choice between small immediate or larger delayed rewards is challenging and a

23   successful resolution requires athletes to stay focused on the distal, larger, and more abstract

24   reward. Consequently, there is a close relationship between a person's long-term motives,

25   ability to delay gratification, and engagement in ongoing self-regulation. From a social

1 cognitive perspective, self-regulation is represented by three cyclical phases (Zimmerman,

2 1989, 2002): *forethought*, which pertains to preparation to perform (e.g., through goal setting,

3 strategic planning); *performance*, which involves executing and monitoring one's strategic

4 plan to perform (e.g., through self-observation, self-instructions); and *self-reflection*, which

5 consists of evaluating one's performance (e.g., through self-judgment, self-reactions). Each

6 phase informs and affects the other. In this view, motivation to perform does not stem just

7 from the task itself (e.g., task value), but also from additional self-regulation processes and

8 attributes (e.g., goal orientation, expected outcomes, self-reactions). These processes

9 subsequently affect interest and persistence to successfully progress toward goal attainment

10 throughout an athletic career (Zimmerman, 2002). An athletic career includes a succession of

11 stages and transitions, and is terminated when the athlete (in)voluntarily ends participation in

12 organized competitive sport (Wylleman, Theeboom, and Lavallee, 2004). The current article

13 explores the motivational and self-regulatory processes involved as athletes proceed through

14 these various stages and transitions in their career development (Stamulova and Wylleman

15 2014).

16   In sum, athletes must be motivated to proactively and strategically plan their actions,

17 manage their time, and evaluate these actions to make necessary adjustments along the way in

18 order to reach long-term goals (Zimmerman, 1989). This important interaction between

19 cognitive competencies and motivational forces has not been investigated throughout elite

20 athletes' career trajectories, and the current study sought to explore these processes inviting

21 World and Olympic Championship medallists to share their stories. With this purpose in

22 mind, we aimed to address the following research question: 'What is the role of different

23 types of motivation and self-regulation competencies as Norwegian winter-sport athletes

24 progress from novice to elite levels?'

25 **Materials and Methods**

1   *Participants*

2   Five Norwegian elite female winter-sport athletes between 23 and 34 years of age (M

3   = 26.20, SD = 4.49) participated. They were active national team members within the same

4   sport at the time of data collection, and were purposefully recruited based on previous

5   accomplishments. All five athletes were selected due to their status as World and Olympic

6   Championship medallists. Elite athletes are generally viewed as driven by high levels of

7   motivation (Pensgaard and Roberts, 2002), both autonomous and controlled forms (Gillet et

8   al., 2012), while simultaneously engaged in more self-regulation processes as compared to

9   less-elite and recreational level athletes (Bartulovic et al., 2017). As the purpose of this

10   interview study was to explore the interactive role of motivation and self-regulation as

11   athletes progress from novice to the most elite levels, it was considered relevant to invite

12   these extremely successful athletes due to their world-class status.

13   *Procedures*

14   Following the approval of the study from the Norwegian Centre for Research Data, we

15   contacted the head of the national team for consent to approach the athletes. Subsequently,

16   athletes were invited to participate, and national ethical standard procedures for the protection

17   of research participants were followed. Prior to signing the declaration of consent, athletes

18   were informed about the research project and their participation rights (e.g., anonymity,

19   confidentiality, and opportunity to withdraw from the study). Following consent, semi-

20   structured interviews were scheduled at the training site during a training camp in the off-

21   season period when athletes trained extensively. The interviews were conducted by a sport

22   psychologist familiar with each athlete, but not working directly with them. Informed by an

23   interview guide based on the motivation and self-regulation framework of the current study,

24   the interview gave athletes an opportunity to provide in-depth information about how they

25   evolved throughout their athletic career. The interview guide was first piloted with two elite

1   level athletes who provided feedback on unsuitable questions (e.g., questions hard to

2   understand, too vague). In addition, we listened to the recording of these interviews to check

3   our own questioning style and improve the questions (Sparkes and Smith, 2013).

4   Initially, athletes were prompted to talk about their everyday life as an elite athlete,

5   which served to 'break the ice'. Then, with an emphasis on motivational and self-regulatory

6   concepts, athletes were asked about their introduction to sport, and their development and

7   maintenance of elite level performances (e.g., What was your introduction to sports and

8   physical activity like? How did you experience these activities and what led to your prolonged

9   engagement?). Throughout the interview, athletes were guided to chronologically elaborate on

10   their sporting experiences and development (e.g., Which personal competencies have

11   influenced your athletic development? How did you plan and reflect upon your experiences in

12   sport? Who were involved in the process of planning and reflection?). Additionally, follow-up

13   questions and comments to prompt athletes' further elaboration were used (e.g., Can you tell

14   me more about ... ?), and served to help athletes in their retrospective reflections. At the end,

15   athletes were asked to describe in detail their experiences during their last season (including

16   the Olympics) and they reflected on their overall career as elite athletes. The interviews lasted

17   between 55 minutes to 1 hr 35 min (average time 1 hr 24 min) and were recorded for

18   transcription.

19   *Data Analysis*

20   Based on the motivation and self-regulation theory frameworks guiding the current

21   study, a thematic analysis approach was used to analyse data, enabling us to identify, analyse,

22   interpret, and report patterns and themes within participants' stories (Smith and Caddick,

23   2012). Thematic analysis is not wedded to any pre-existing theoretical framework or research

24   philosophy, even though it is important that the researchers' position is made clear (Braun and

25   Clarke, 2006). The current study falls within a post-positivistic epistemology, which claims

1   that objectivity and value-free inquiry is unachieveable in science; and multiple methods, both

2   quantitative and qualitative, are needed as all methods are imperfect (Patton, 2015). Thus,

3   post-positivism provides a decent philosophical position to test the interplay of motivation

4   and self-regulation previously investigated by means of quantitative methods, and adequately

5   guides the thematic analysis in the current study. A six-step procedure was followed in the

6   preparation and analysis of data (Braun and Clarke, 2006). First, interviews were transcribed

7   verbatim, which produced 165 single-spaced pages of transcripts. We read and re-read

8   transcripts while listening to the audiotapes to familiarize ourselves with the data and correct

9   any errors. Second, we deductively created 99 initial codes representing the raw units of texts

10   based on the motivation (e.g., playful, curiosity-driven, self-imposed pressure, external

11   demands, and no intentions) and self-regulation (e.g., analyse task, self-recording, selecting

12   courses of action, self-judgment, and self-satisfaction) theoretical perspectives guiding the

13   current study, using the qualitative data analysis software MAXQDA (VERBI Software,

14   GmbH, 1989-2015). Third, we verified the codes' organization, and inductively developed

15   latent themes based on associations between motivation regulations and self-regulation

16   competencies emerging from the athletes' stories (e.g., *Motivational shifts evoked planning*

17   *and self-control competencies*). In the fourth and fifth step of the analysis, we reviewed latent

18   themes, and cross-referenced them with the coded data to increase consistency (Braun and

19   Clarke, 2006). Finally, we summarized the main research findings and identified citations,

20   providing a rich description of the athletes' experiences. Interviews were conducted in the

21   athletes' mother tongue (i.e., Norwegian), and citations were translated by the first author and

22   checked for accuracy by a bilingual researcher.

23   *Trustworthiness*

24   Several steps were followed to enhance the trustworthiness of findings. First, the sport

25   psychologist who interviewed the athletes was familiar with the elite sport context, which

1 facilitated the discussion and helped establish trust and rapport. Prior to data analysis, we e-

2 mailed the transcribed interviews to athletes. This may produce additional insight in the

3 processes of analysing data and generating results, and the well-known athletes in the current

4 study got an opportunity to withdraw, add to, and comment information provided in the

5 interviews. Such member reflections do not suggest a single true reality constrained to few

6 paradigmatic approaches, but rather provide a correspondence between the researcher and

7 participants being studied (Randall and Phoenix, 2009; Smith and McGannon, 2017; Tracy,

8 2010). However, athletes verified the information and did not suggest modifications. Then,

9 inter-coder reliability was evaluated to verify coding consistency according to the

10 assumptions of post-positivism (Campbell et al., 2013). We checked for differences between

11 two researchers, familiar with athletes' context and the theoretical frameworks of the current

12 study, adopting current inter-coder reliability guidelines (MacPhail et al., 2016). Following a

13 discussion of differences and adjustments of the coding system, Cohen's kappa scores showed

14 a satisfactory degree of agreement (i.e., $\kappa = 0.58$; Burla et al., 2008; MacPhail et al., 2016).

15 Furthermore, with prolonged engagement in research and applied practice with elite athletes,

16 the co-authors engaged in ongoing peer debriefing and validated the analysis, research report,

17 and current article. Finally, we kept a detailed audit trail to document each step of the research

18 process (Sparkes and Smith, 2013). Nonetheless, we are mindful of what can be claimed by

19 one single study, and encourage readers to reflect upon the findings and determine their

20 transferability to other athletes, contexts, and populations (Sparkes and Smith, 2013; Tracy,

21 2010). Throughout their junior and senior level career, current study athletes participated at

22 the highest level in their sport, and the innate motivational forces and cognitive competencies

23 acquired in this developmental process are likely transferable to athletes or actors in other

24 elite or sub-elite performance settings. Thus, formal generalizations are inappropriate, but

1   findings 'can be extrapolated beyond the immediate confines of the site' (Charmaz, 2005,

2   528).

3   **Results and Discussion**

4   As outlined above, stories from five World and Olympic Championship medallists'

5   career trajectories were thematically analysed guided by motivation and self-regulation

6   theories. These theoretical frameworks served as resources for the interpretation of athletes'

7   stories, exclusively focusing on the content of what was said (Riessman, 2008). Athletes,

8   named by the pseudonyms Kari, Sunniva, Berit, Aase, and Anna, revealed both similarities

9   and differences in their trajectories toward the elite level and in their experiences of

10   motivation and self-regulation. However, we focused on common aspects that reflected the

11   individual athlete's trajectory, while providing specific examples of the interplay between

12   motivation and self-regulation in four themes. This way, we withheld characteristic stories to

13   maintain the well-known athletes' anonymity. Results are presented chronologically, based on

14   athletes' descriptions (Horsburgh, 2003) and examples of how their motivation and self-

15   regulation competencies changed over the years. In order to be succinct and efficient, we

16   integrated the results and discussion. Table 1 summarizes the role of different types of

17   motivation and self-regulation processes across the athletes' career.

18   [Table 1 near here]

19   *Motivational Shifts Evoked Planning and Self-Control Competencies*

20   In the first period of the athletes' careers, the athletes were approximately two to 12

21   years and mainly characterized by intrinsic motivation and low self-regulation. All athletes

22   reported having been extremely physically active during childhood, and their engagement was

23   characterized by enjoyment and intrinsic interest. They were influenced by parents and

24   siblings, and parents facilitated participation in activities that were organized by coaches.

25   Between ages six to 10, athletes did not have individualized training programs, and viewed

26   training sessions and competitions as social activities: 'Everything before that [participation in

1   organized training sessions] was just play. I participated in competitions, travelled around ...

2   and thought it was fun. The competitions and the awards ceremony afterwards were really

3   social' (Kari). Sport activities were not considered too seriously, and athletes engaged in a

4   variety of sports (e.g., soccer, handball, cross-country skiing, biathlon, and athletics). They

5   did not have sport-specific goals, and did not consciously exert self-regulatory efforts to

6   perform well: 'That is how it started, we just played. It was never, at least almost never, that

7   we were supposed to do something specific concerned with the amount or quality of training,

8   we were just outside having fun!' (Berit).

9   These findings regarding intrinsic motivation are in line with SDT's assumption that

10   children's participation in sport is stimulated by inherent pleasure and satisfaction (Ryan and

11   Deci, 2000). Dominated by these elements of intrinsic motivation, the child athletes did not

12   focus on results and the competitive aspect of activities. As confirmed by Durand-Bush and

13   Salmela (2002), internal motives to play and have fun appear essential to fuel current study

14   athletes ongoing engagement and future intentions in sport . This initial engagement did not

15   seem overly influenced by self-regulation competencies, as the child athletes' intrinsic

16   motivation directed their actions and importantly made them flourish and develop their sport

17   competencies (Deci and Ryan, 1985).

18   All five athletes reported that in the latter part of this period, there was a shift in their

19   motivation, as they began to experience competitiveness and success. They participated in

20   specific sport activities to follow older, more mature siblings and cousins, although somewhat

21   unconsciously. Motivated by their wish to keep up with others, they became increasingly

22   aware of normative competence and their own willpower to succeed. They developed

23   expectations to perform well, and their motives to participate in sport gradually became more

24   extrinsic. As stated by Sunniva: 'I wanted to be closer to my competitor ... and suddenly I

25   reached that goal. I was even closer the next competitive season ... These achievements really

1   inspired me to train and increase my performance'. They did what they could to increase their

2   chance of winning when participating in activities, training, and competitions, as stated by

3   Aase, 'I have always been competitive. For example, when I was hiking with my family on

4   the weekends, I always had to turn back home before everybody else. Then I was confident

5   that I won the trip.' At this early age the athletes were not ranked, but they knew who won the

6   race by comparing their time to that of their competitors. This led them to use self-regulatory

7   competencies: they did not reflect on or evaluate their performances, but started to develop

8   forethought phase competencies, such as strategic planning. However, they did not

9   deliberately plan a long-term sports career, even though they dreamed of it when watching

10   elite athletes on TV: 'I never thought I should go pro in this sport ... but I always had a dream,

11   watching elite athletes on TV' (Sunniva). Thus, role models nurtured their intrinsic and

12   extrinsic drive for development. In addition, athletes recalled training with boys and older

13   athletes, who were physically stronger, as stated by Anna, 'It was those years when I started

14   training activities at my club. I remember the boys in my class because only one or two girls

15   participated. It was actually training with the boys.'

16   As the athletes developed competitiveness and achieved success, they seemed to gain

17   a more varied motivation profile, combining intrinsic and extrinsic reasons to participate in

18   sports. This emerging drive fuelled by both self-determined and controlled types of

19   motivation did not seem to reduce athletes' ongoing engagement and their development.

20   Rather, this motivation profile may result in positive performance outcomes and athletes

21   performing at a high level (e.g., Gillet et al., 2012). Current study athletes experienced the

22   pleasure of winning, while also experiencing intrinsic motivation for sport—indeed, young

23   athletes value winning (Breiger et al., 2015). Even though the study athletes seemed self-

24   directed at this age, they did not deliberately self-regulate. These findings support the notion

25   that while self-regulation capacity can be developed through childhood (Steiner and Carr,

1   2003), young athletes may be easily distracted and dismiss self-regulatory efforts

2   (Zimmerman, 2002). However, current study athletes still benefited from planning and self-

3   control competencies, such as goal directed behaviours. When engaged in activities like sport,

4   these psychological competencies will increase the chances of winning (Mischel, 2014).

5   ***The External Control Constrained Athletes' Self-Regulation***

6   In early adolescence—age 13–15—the athletes were driven by integrated, introjected,

7   and external motivation regulations. They used their planning skills, and even though they felt

8   somewhat controlled by coaches, they also engaged in co-regulation with them. Athletes'

9   sport activities were more structured as they focused more deliberately on training. They were

10   ranked in competitions, and their enjoyment and fun were more influenced by mastery and

11   results. Opportunities to do well and win was a forceful motivator: 'I was a youth star doing

12   my sport. I almost won everything. I was very happy to succeed' (Kari). Berit also recalled,

13   'It is of course fun to master something! I thought it was really fun to be at training when I

14   mastered things well!' In addition, athletes were extremely motivated to train: 'I have always

15   been very systematic. Even in severe snowstorms, I pushed myself to go outside to train'

16   (Sunniva). Together with their teammates, siblings, and cousins, they jointly executed training

17   activities. However, their coaches appeared to have limited their development of self-

18   regulatory skills (e.g., decision making). For example, coaches typically decided on the

19   training content, as stated by Anna, 'I just went with whatever was planned, and the coaches

20   were in control.'

21   In sum, athletes' reported motivation was especially characterized by integrated and

22   introjected regulations during their adolescent years. Guided by their coaches, this fostered

23   co-regulation rather than self-regulation as the study athletes were somewhat externally

24   controlled. This co-regulation may help nurture athletes' self-regulation over time. (Collins

25   and Durand-Bush, 2014; Zimmerman, 2002). However, in certain cases and despite good

26   intentions, coaches' control can result in negative consequences over time, as athletes may not

1   learn to self-regulate key behaviours to ensure optimal adaptation of training load and

2   recovery (Bartholomew et al., 2011). Athletes reported feelings of fun and enjoyment related

3   to winning, clearly developing extrinsic motives for sport participation. Thus, it seems that

4   extrinsic forms of motivation may go hand in hand with intrinsic forms of motivation, and are

5   not necessarily negative as they lead to continued participation (Ullrich-French and Smith,

6   2009).

7   In the mid of their teenage years, the athletes were increasingly concerned about their

8   progress and effort. They had an inclination for self-directedness and competitiveness. Even

9   though their participation motives were integrated and self-determined, their progress and

10   satisfaction was largely contingent on comparisons and outcome evaluations. This was stated

11   by Sunniva: 'I started to enjoy the activities in my sport when I performed better... my goal

12   was to improve my time by 20 seconds, or be a little closer to my competitors.' As they

13   emphasized an external focus, athletes often referred to and evaluated competencies based on

14   performance levels or rankings, and not how they felt during competitions. They analysed

15   other athletes' competencies and developed strategies to improve their own abilities. As such,

16   it seems that expectations were self-initiated. Anna said, 'There were no requirements [e.g.,

17   from coaches or significant others], the only requirement was that you wanted to do your

18   sport, actually. You did not have to compete at a certain level.'

19   These statements highlight a shift in athletes' motivation and focus, from enjoyment

20   and inherent rewards experienced within activities to more controlled mastery and winning.

21   However, they perceived this competitive focus to facilitate performance, both before and

22   during competitions. As such, athletes seemed to thrive under their self-imposed pressure

23   when this pressure evoked pleasant and positive feelings. Consistent with studies examining

24   affective states in athletes (e.g., Martinent et al., 2013), these positive feelings likely helped

25   athletes attain their achievement goals. This further exemplifies the nuances described in SDT

1   and the assumption that external controllers will increase thriving and well-being when more

2   autonomously adopted (Ryan and Deci, 2000). At this age, the athletes seemed to internalize

3   this external control, as they reported personal importance concerning their engagement in

4   this competitive context. As such, autonomous feelings and motivational drive nurture rather

5   than constrain self-control capacity when athletes push themselves to train and perform

6   (Englert and Bertrams, 2015; Jordalen et al., 2016).

7   *Self-Control and Reflection in Extrinsically Driven Athletes*

8   At the age of 16 to 19 years, the athletes used particularly forethought and

9   performance phase competencies (e.g., planning, self-control, and self-monitoring), and

10   eventually reflected on their sport activities. They were driven by integrated, introjected, and

11   external motivation regulations, and to a lesser extent intrinsic motivation. Even though they

12   experienced increased co-regulation with their coaches, they still felt somewhat externally

13   controlled. Athletes chose to attend elite sport colleges or made the conscious decision of

14   investing in their studies. During this period, they reached junior elite levels of performance

15   and were recognized for their competencies. Still participating in several sports, athletes were

16   challenged to make choices and narrow their focus (e.g., future focus on sport, team, and

17   coach). The uncertainty concerning team selection seemed to constrain them and provoke

18   conflicts, as Anna said, 'Yes, they said that if I wanted to continue being part of the team, I

19   had to choose their sport. It was too early for me to make that decision.' However, they chose

20   specific teams for economic and strategic reasons (e.g., financial support, teammates at their

21   age and level), which added to their perception of external control:

22

23   I was there because of the sport. I needed someone at a higher level, but at the same

24   time, [I missed] the social environment on my former team, those athletes, my

25   classmates ... It was difficult to decide whether I should change team. (Anna)

26

1   At this age, the athletes still developed and transferred competencies within and between

2   different sports, and experienced benefits of being multi-sport athletes: 'I think you can use

3   your competencies in one sport and also transfer it to another, and I really thought I could

4   combine them [several sports] well' (Anna). However, athletes finally chose one sport: 'It was

5   when I started at the elite sport college, that I chose to mainly focus on one sport' (Berit).

6   The fact that athletes still focused on several sports at this stage of their career

7   contradicts developmental models within sport (e.g., the Developmental Model of Sport

8   Participation; Côté, Baker, and Abernethy, 2007), and suggests an alternative pathway to

9   expert performance (Coutinho, Mesquita, and Fonseca, 2016). Athletes seemed to experience

10   many dual motive conflicts (e.g., one or several sports, changing team), and they especially

11   experienced the decision to focus on one sport as difficult. This shows that external control

12   and uncertain outcomes constrain individuals due to feelings of low autonomy (Ryan and

13   Deci, 2000). However, at one point current study athletes wholeheartedly endorsed their

14   options, and influenced their own development as they found their way through these

15   difficulties. Thus, self-regulation competencies help athletes initiate and direct effort in their

16   goal achievement (Zimmerman, 1989).

17   Late in their adolescent years, the athletes eventually chose sport environments in

18   which they had the best chances for success: 'I enjoyed other sports, but I performed best in

19   this sport. I chose this sport because of my competitiveness. I really wanted to win' (Aase).

20   Kari also talked about her sport environment, and said: 'There were activities every day. I did

21   many training sessions with boys, comparing myself to them, and pushing myself a lot. I think

22   that has been important'. These experiences reinforced their competitive attitude and their

23   willpower to stay focused, and they often viewed regular training sessions as competitions:

24   'That was the first time I met female athletes who pushed themselves like I did. It really

25   inspired me! At almost every training, we competed against each other. We continued like

1   this throughout the offseason period' (Berit). This extrinsic drive fuelled athletes'

2   development of self-regulatory competencies, as they were creative in choosing different

3   strategies for goal achievement, as stated by Anna: 'I decided to train a lot more on the junior

4   national team. I was very systematic.' Athletes pushed themselves because of self-imposed

5   expectations. They strived to be as good as their teammates and gained from competitive

6   training groups: 'When I joined the junior team, I was at the lowest level in that team, and

7   then I became the best, or second best. In my experience, having training sessions with

8   athletes at a higher level helped a lot' (Aase).

9   At this point in their career, athletes' competitiveness and extrinsic drive seemed to

10   fuel their self-control and willpower. However, it is not necessarily the extrinsic drive that

11   fuelled their self-control competencies, but the positive effects they gained from extreme

12   bouts of training activity (Audiffren and André, 2015). During physical activity, the prefrontal

13   brain areas activated to succeed in self-regulation and self-control are strengthened by a

14   positive mood—Baumeister et al.'s (2007) metaphor *the muscle of self-control* literally may

15   have increased through athletes' physical efforts. As they enjoyed putting pressure on

16   themselves and perform at a high level, they somewhat internalized an external competition

17   pressure analogous to SDT's introjected motivation regulation (e.g., see Ryan and Deci,

18   2000).

19   When athletes competed in junior World Championships during their late adolescent

20   years, they experienced a lack of self-reflection phase competencies regarding their training

21   (e.g., self-evaluation). They realized they had to use planning and reflection more

22   deliberately, highlighted by Anna's dialogue with the junior national team coach: 'When the

23   coach asked me about my former training, I had no clue! I did not count hours or intervals. I

24   really did not know, and the coach was shocked.' Thus, athletes' reflection competencies

25   were not as impressive as their sport performances (e.g., they did not consciously reflect on

1   how their training influenced their body and performances), and they trusted their national

2   team coaches' planning and reflection: 'I was very conscientious. I always did what he told

3   me to. He planned my training, and I completed it without listening to my body' (Kari).

4   Furthermore, in training and competitions, their reflections and self-evaluation were not

5   always encouraging, as stated by Sunniva: 'When I trained, I always felt I should have done

6   more and pushed harder. When a hard workout went bad, I called my coach and said "the

7   season will be ruined"!' Kari also talked about her achievements and her overly negative self-

8   evaluation. When she went to her last junior World Championship, she was sick and had

9   problems before the competitions: 'I did not succeed in that championship, and I finished 6th

10   ... That was actually one period where I suffered adversity.'

11   Even though the athletes pondered their opportunities, choices, and performances,

12   their interpretations were not always fair, and they often underestimated themselves. Their

13   metacognitive skills were constantly challenged, as they personalized and contextualized

14   these skills to the demands of their sport and their current situation. While research findings

15   suggest that there are differences in the development of these skills between athletes who

16   eventually reach international versus national senior level (Jonker et al., 2012), this study's

17   athletes reached the highest level of performance in their sport and did not demonstrate

18   refined metacognitive skills at this stage of their development.

19   *Elite Athletes' Multidimensional Motivation and Self-Regulation Profile*

20   At the age of 20 years and onward, athletes showed a complex motivation profile,

21   which involved introjected, external, identified, and integrated motivation regulations. A

22   cluster of forethought, performance, and self-reflection phase self-regulation competencies,

23   such as self-control, planning, self-monitoring, and self-evaluation, served these various types

24   of motivation. At this age, athletes reached and strived to maintain senior elite level

25   performances in one sport. They enjoyed pushing themselves and were more aware of

26   important mental characteristics of performance (e.g., willpower, perseverance, work toward

1   goals, focus), which they integrated in their training: 'I was even more concerned about my

2   training, more focused regarding technique and other details to improve ... I consciously

3   developed this mindset' (Sunniva). Retrospectively evaluating characteristics important in her

4   development, Anna confirmed: 'My willpower, desire, and competitive nature ... pushed me

5   to where I am.' Performing at the senior elite level, they realized it was difficult to maintain

6   performances throughout a competitive season, and planned and prioritized when they wanted

7   to succeed: 'Prior to this season, I trained harder. I did not increase the amount, but I had

8   some really tough training sessions. Hopefully, this will help me perform early and qualify for

9   the team' (Aase). Their normative awareness resulted in adjustments of different performance

10   variables, such as moving closer to teammates: 'A lot of athletes on my team live here ... that

11   was one of the reasons I moved' (Anna).

12   At this level, the athletes developed mental characteristics and competencies to deal

13   with external and internal pressures of training and competitions. When other elements of

14   elite-level performances have been developed (e.g., regarding physical fitness, strength, and

15   technique), these mental factors may decide who wins in the end (Boes et al.,2014). Current

16   study athletes seemed to experience feelings of self-efficacy, control, and personal agency, as

17   they were more self-directed and self-determined, adjusting strategies and details in their

18   training (Bandura, 2012). They were typically more relaxed, and benefited from integrating

19   the core values of achievement behaviours (Ryan and Deci, 2000).

20   Athletes possessed a multidimensional motivation profile, and seemed to gain from

21   these complex motivational forces through their self-regulatory competencies:

22

23   Above all, I really enjoy doing my sport! It is important that I decide what I am going

24   to do ... I enjoy planning. When the coach sends me his suggestions, I do revisions and

25   make my own plan. This motivates me ... discussing strategies with my teammates,

1   and maybe learn something new. I always want to meet my teammates and train with

2   them. I enjoy the social environment. (Berit).

3

4   At this stage, athletes used self-regulatory competencies to monitor and adjust training

5   strategies, for example using training logs: 'I often read my log to see what I did before I

6   performed well. It helps me when I am planning how to succeed, and it is also valuable when

7   I am exhausted, to figure out what went wrong' (Aase). All athletes successfully co-regulated

8   with their coaches, and seemed to balance listening to them and listening to their inner voice:

9   'Generally, he decides how many hours, type of activity, and so on. Most often I agree with

10   him, but I always adapt his program to my everyday activities and sometimes I make changes'

11   (Berit). Thus, they recognized the knowledge of coaches when discussing training sessions, as

12   stated by Aase, 'We are planning with the coach when we are at a training camp, in regard to

13   what type of training we are going to do before the next time we meet. How to improve every

14   month.'

15   As the athletes entered the senior elite level and reached high levels of performance,

16   they developed mental characteristics (e.g., mental toughness, being independent) that served

17   their motivation and increased their eagerness for sport participation. These characteristics

18   often appear after reaching high levels of performance (Boes et al., 2014; Durand-Bush and

19   Salmela, 2002). The elite athletes were driven by complex patterns of motivation, as they

20   strived for outstanding results in World and Olympic Championships and really enjoyed their

21   sport at the same time analogous to what Gillet and colleagues (2012) termed a high

22   motivation profile (i.e., high self-determined and high controlled motivation). Self-regulatory

23   competencies may serve this exceptional drive (Baumeister, 2016), and indeed did, as the

24   study athletes enthusiastically monitored and recorded performances, developed and changed

25   strategies for goal attainment, and also adjusted and individualized coaches' planning. This

1 internalization of behaviours and strategies reflected their multidimensional motivation (Ryan

2 and Deci, 2000).

3 *Limitations*

4   Interviewed at the training site, the athletes were likely influenced by high amounts of

5 training when they recollected memories from the past and interpretatively talked about their

6 career (Randall and Phoenix, 2009). These recollections might be approximations of what

7 actually happened, and will be a representation of for example athletes' memory, the timing

8 and context of the interview, and the power relations between the interviewee and the

9 interviewer. However, reflections in interview studies will always be retrospective, and

10 readers should consider generalizability of findings accordingly (Tracy, 2010). In addition,

11 only female athletes participated in the current study. Including male athletes could have

12 changed the results, as gender may influence self-regulation processes (e.g., Honga et al.,

13 2017). The sport psychologist who conducted the interviews was not involved with the

14 athletes' team, but he did work with other teams at the training site. As such, athletes may

15 have felt pressured to participate or might have responded based on social desirability or

16 consistency motives (Podsakoff et al., 2003). In addition, even though we asked athletes to

17 confirm or elaborate on details of their stories, they did not comment our research findings.

18 More extensive member reflections when analysing data may enhance qualitative credibility,

19 providing an opportunity for collaboration and reflexive elaboration (Tracy, 2010).

20 *Future Research*

21   This unique study sheds light on the important interplay between motivation and self-

22 regulation throughout the development of world-class athletes. However, the current study

23 used a retrospective design, reporting female athletes' approximations of their life stories.

24 Future research should prospectively explore how athletes of both gender develop through

25 different career phases and use self-regulation competencies in line with their motivation

1   (Coutinho et al., 2016). For example, athletes may add motivation and self-regulation aspects

2   of their everyday training and competition practices in their training logs. This may help

3   researchers grasp the development and interaction of self-regulation and motivation related to

4   sport, and how co-regulation with the coach influences athletes' development of self-

5   regulation competencies in accordance with their motivation profiles. Athletes in this study

6   developed forethought phase competencies earlier compared to self-reflection phase

7   competencies, which were evident later in their career. In highly competitive contexts, these

8   athletes were somewhat discouraged to develop these competencies, supporting the notion

9   that significant others may undermine athletes' development and use of self-regulation

10   competencies (Zimmerman, 2002). We recommend that future studies investigate the

11   development and order in which these competencies develop, in relationship to athletes'

12   shifting motivation and along with the role of their coaches. By inviting both athletes and

13   coaches to participate, it is possible to track the role of coaches in athletes' development of

14   self-regulation competencies to explore the potential effect of coaches' external control. To

15   understand such time-related trajectories and development phenomena, longitudinal research

16   is needed (Coutinho et al., 2016; Stenling, Ivarsson, and Lindwall, 2017). In addition, we

17   recommend the use of both qualitative and quantitative methods to generate new insights not

18   gleaned from the individual methods alone (Patton, 2015). For example, by the use of

19   narrative inquiry studying athletes' stories as they unfold over time (Smith, 2010) and by

20   measuring within person change to study each athletes' development, respectively (Stenling et

21   al., 2017).

22   *Applied Implications*

23   In the current study, athletes' initial engagement in sport was characterized by low

24   self-regulation and autonomous, particularly intrinsic, motivation. They continued their sport

25   activities, which supports SDT arguments that autonomously driven activities are maintained

1   over time (Deci and Ryan, 1985; Ryan and Deci, 2017). As such, coaches should seek to

2   create autonomy supportive climates enhancing athletes' self-determined motivation

3   (Bartholomew et al., 2011; Bartholomew, Ntoumanis, and Thøgersen-Ntoumani, 2009;

4   Fenton et al., 2014). However, the successful study athletes were early aware of the

5   competitive aspect of activities, and also experienced extrinsic motives for sport. This

6   suggests that coaches and significant others should facilitate both self-determined and

7   controlled types of motivation to help athletes perform at the highest level (Gillet et al., 2012).

8   The controlled types of motivation were even strengthened as the study athletes grew

9   and excelled to international elite levels, which encouraged the use of self-regulation

10   competencies when autonomously adopted (see also, Englert and Bertrams, 2015b; Jordalen

11   et al., 2016). Even though the athletes developed a variety of self-regulation competencies,

12   their reflection was still inadequate in their senior years. Coaches should be encouraged to

13   help communicate and facilitate the development of these competencies, and nurture rather

14   than control this process (e.g., Bartholomew et al., 2011; Collins and Durand-Bush, 2014).

15   Further, the study athletes' awareness of other mental characteristics of elite level

16   performances increased at this level (e.g., willpower and their competitive nature), and it

17   seems decisive to recognize and practice these characteristics to finally succeed (Boes et al.,

18   2014).

19   **Conclusion**

20   Results from the current study clearly illustrate an interplay between motivation and

21   self-regulation throughout elite athletes' career paths. Introduced to sports at a young age,

22   these five world-class female athletes were driven by experiences of fun and enjoyment, and

23   their metacognitive processes were limited. Recognizing the competitive aspect of sport, they

24   experienced an external shift in motivation. This led the athletes to develop planning

25   strategies (e.g., goal setting) to guide their actions, but reflections on training and competition

1   results was inadequate. Later on, the athletes were highly concerned with outcomes, and

2   strived to win competitions and dominate training activities. These self-imposed expectations

3   stimulated their willpower and self-discipline, and they performed at a high level in sports and

4   other areas of life. At the junior level, they were challenged to make choices, and with

5   increased self-reflection skills, they based their decisions regarding sport participation on

6   intrinsic and extrinsic reasons. Reaching the status of World and Olympic Champion at the

7   senior level, these five athletes especially recognized the importance of their competitive

8   attitude, willpower, and enjoyment. Their self-regulation capacity encouraged by external

9   motives was arguably beneficial, and their elite level performances were fuelled by a complex

10 motivation. They benefited from co-regulation with their coaches and exerted the most control

11 over their training and competition plans. Athletes' stories highlight the interaction of

12 motivational desires and cognitive competencies directing their development toward elite

13 level performances in a non-linear fashion. It is important that coaches and significant others

14 stimulate and reinforce athletes' motivational desires, and in addition guide rather than

15 override their metacognitive thinking through co-regulation. This emphasizes the importance

16 of athletes' awareness and responsibility of their own development, with coaches and

17 significant others' competencies modestly available.

21 **Declaration of interest statement**

22   The authors reported no potential conflict of interest.

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21

1   Table 1

2   *From Novice to Elite Athletes: The Role of Motivation and Self-Regulation*

	Child athletes	Youth athletes	Junior athletes	Senior athletes
Age (years)	2 ⟶	13 ⟶	16 ⟶	20 ⟶

Self-regulation	Low
	
	Slight increase in planning
		Moderate
		
		Planning
		    Self-control
			Moderate
			
			Planning
			    Self-control
			Some self-monitoring
			Low self-reflection
				High
				
				Self-control
				Planning
				Self-monitoring
				    Self-reflection

Other-regulation	Some coach and parent regulation	Coach, Co-regulation	Coach, Co-regulation	Coach, Co-regulation

Motivation	Intrinsic
	    Introjected
		Integrated
		    Introjected
		    Intrinsic
		    External
			Introjected
			Integrated
			Intrinsic
			External
				Introjected
				External
				Identified
				Integrated

3   *Note*. Prevalent characteristics in the beginning of and during each stage are presented to the

4   left; Latent characteristics at the end of each stage are presented to the right; Prevalent

5   characteristics: normal font size; Latent characteristics: small font size; Co-regulation:

6   athletes are to a certain extent involved in their own regulation, although guided by their

7   coaches and/or parents.

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