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Emotion Regulation

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14 **Emotion Regulation**

15 How do athletes feel when they perform at their best? How can they reach and
16 maintain optimal feeling states? How do athletes feel when they perform poorly? How can
17 they stay away or regulate their dysfunctional feelings? How can they optimize their
18 performance? These are critical questions for athletes, coaches, and practitioners that have
19 also attracted the attention of researchers. Indeed, athletes' ability to regulate their emotional
20 states is crucial for a successful performance. For decades, researchers have examined the
21 relationships between emotions and performance (Hanin, 2000; Jones, Lane, Bray, Uphill, &
22 Catlin, 2005; Lane et al., 2016; Ruiz, Raglin, & Hanin, 2017; Turner & Jones, 2018). Anxiety,
23 as the most common emotion that athletes experience prior to competition, was the focus of
24 initial research, which aimed at understanding how such emotion could influence performance
25 (Hanton, Mellalieu, & Williams, 2015; Marchant, Maher, & Wang, 2014; Turner & Jones,
26 2018). Beyond anxiety, however, athletes experience an array of emotions, which can be
27 functional or dysfunctional for their performance. There is, therefore, a need of a more
28 holistic approach to the study of a variety of unpleasant and pleasant emotions and other non-
29 emotion components of athletes' experiences, which form the so-called psychobiosocial
30 states. Because of the acknowledged impact of emotions on performance, emotion regulation
31 strategies have attracted research attention in recent years (Friesen et al., 2013; Lane, Beedie,
32 Jones, Uphill, & Devonport, 2012). Although emotion-centred strategies are useful to
33 improve performance, a combination of strategies focused on emotional states as well as in
34 action or task-execution patterns are deemed as most effective (Bortoli, Bertollo, Hanin, &
35 Robazza, 2012; Robazza, Bertollo, Filho, Hanin, & Bortoli, 2016).

36 In the following section we include a brief review of the emotion-performance
37 relationship literature. We then describe psychobiosocial states and their defining
38 characteristics as conceptualized within the individual zones of optimal functioning (IZOF;

39 Hanin, 2007) model as applied to emotion regulation. Finally, we introduce the multi-action
40 plan (MAP; Bortoli et al., 2012) model, which has been developed for emotion and action
41 regulation in the optimization of athletes' performance. Some directions for future research
42 are also proposed.

43 **The Emotion-Performance Relationship**

44 Conceptual ambiguity has characterized the emotion literature. Constructs such as
45 affect, emotion, and mood have been used interchangeably, although theorists acknowledge
46 that they are different (Beedie, Terry, & Lane, 2005; Ekkekakis, 2012; Keltner, Oatley, &
47 Jenkins, 2014). Affect, defined as the subjective sense of positivity or negativity arising from
48 an experience (Carver, 2003), is viewed as the superordinate category of individuals'
49 experiences, which includes emotion and mood. Affect has been categorized using global
50 dimensions such as valence (pleasant vs. unpleasant), and activation (high vs. low; Russell,
51 2003). Emotions, on the other hand, can be considered as discrete categories (e.g., anger,
52 anxiety, happiness) with different antecedents and consequences. For instance, Lazarus
53 (2000) stated that appraisals of the person-environment interaction result in specific core
54 relational themes or meanings, which facilitate adaptation. Eight negatively-toned emotions
55 (e.g., anxiety, shame, guilt) and seven positively-toned emotions (e.g., pride, hope) with
56 specific core relational themes are distinguished, although, there is no consensus regarding the
57 total number of emotions (Scarantino, 2015). For instance, Ekman, Friesen, and Ellsworth
58 (1972) postulated 6-7 emotions (i.e., happiness, surprise, fear, sadness, anger, and disgust
59 combined with contempt) whereas Lazarus distinguished 15 emotions (i.e., anger, anxiety,
60 fright, guilt, shame, sadness, envy, jealousy, happiness, pride, relief, hope, love, gratitude, and
61 compassion). Emotion and mood have been differentiated based on the cause, duration,
62 intensity, and action tendencies that are associated with both phenomena (Beedie et al., 2005;
63 Shuman & Scherer, 2015). Emotions are considered to be relatively brief and intense, related

64 to a specific object (e.g., an athlete may be angry at a referee), and underlying specific
65 tendencies for action (e.g., tendency to correct the wrongdoing), whereas moods are less
66 intense, last longer in time, do not have an identifiable cause, and are associated with broader
67 approach-avoidance tendencies.

68 An extensive body of research has focused on understanding the influence of
69 emotional phenomena on athletic performance, with several theoretical frameworks offering
70 accounts of this relationship (for a summary of selected approaches, see Table 1). Some of
71 these theoretical approaches have been developed within sport settings, while other models
72 have been adapted or borrowed from mainstream psychology. Early approaches focused on a
73 unidimensional construct (i.e., arousal) or the detrimental effects on performance of anxiety as
74 a single, though most commonly experienced, emotion. However, as Hackfort and
75 Schwenkmezger (1993) pointed out, anxiety can be better differentiated into worry and
76 emotionality components. Worry is conceived as a cognitive process that involves, for
77 example, doubts about one's own performance in comparison with others and preoccupation
78 on the consequences of failure for oneself and the others, while emotionality consists of
79 affective-physiological symptoms determined by increased arousal, such as increased heart
80 rate, stomach butterflies, and sweaty hands. Some of the mechanisms by which anxiety
81 influences performance have been explained using different theoretical perspectives, such as
82 conscious processing (Masters & Maxwell, 2008), attentional control (Eysenck & Wilson,
83 2016; Payne, Wilson, & Vine, 2018; Vine, Moore, & Wilson, 2016), and ironic processes of
84 mental control, namely the tendency to commit errors one is trying to avoid (Wegner, 2009).
85 One theoretical assumption is that anxiety impairs performance by exerting changes in
86 attention and visuomotor control. For example, Eysenck and Wilson (2016) postulated that
87 anxiety influences cognitive processing by producing an attentional bias that makes
88 individuals focus their attention disproportionately to threat-related stimuli. Other explanations

89 consider the negative impact of anxiety on thought processing by leading individuals to
90 reinvest their attention focus on automated processes, thereby disrupting movement execution
91 (Masters & Maxwell, 2008), or to commit counter-intentional errors (Wegner, 2009).

92 Athletes, however, not only experience anxiety. Many researchers have indicated that
93 athletes experience a variety of pleasant and unpleasant emotions (Jones et al., 2005; Lane et
94 al., 2016; McCarthy, 2011) that can enhance or impair performance (Robazza et al., 2018;
95 Ruiz, Hanin, & Robazza, 2016). Some theoretical approaches have focused on the
96 relationship between several moods, as measured on the Profile of Mood States (POMS;
97 McNair, Lorr, & Droppleman, 1971), and performance, postulating that positive mood (i.e.,
98 vigour) facilitates performance, while negative mood (e.g., depression) impairs performance
99 (Morgan, 1985). Lane and collaborators have extended this notion suggesting that high
100 intensity of negative mood in combination with depressive mood may be harmful for
101 performance, whereas the same mood in absence of depression may be beneficial (Lane &
102 Terry, 2000; Lane, Terry, Devonport, Friesen, & Totterdell, 2017). This notion has been
103 tested using the POMS and derivative instruments such as the Brunel Mood Scale (BRUMS;
104 Terry, Lane, Lane, & Keohane, 1999; Terry, Lane, & Fogarty, 2003). The authors have
105 extended the model to examine the effect of high vs. low activation of pleasant and unpleasant
106 emotions with a large sample of participants assessed on the Sport Emotion Questionnaire
107 (SEQ; Jones et al., 2005), which includes five emotional constructs (i.e., anger, anxiety,
108 dejection, excitement, and happiness).

109 To fully understand the athletes' pleasant and unpleasant states associated with their
110 performances, it is important to explore the idiosyncratic nature of these experiences (Hanin,
111 2000). The individual zones of optimal functioning (IZOF) model (Hanin, 2007, 2010) is a
112 theoretical approach focused on individual states and specifically designed for the sport
113 context. Drawing on the cognitive-motivational-relational theory (Lazarus, 2000), the IZOF

114 model recognizes individual differences in the perception and interpretation of one's own
115 experiences associated with sports performance.

116 **Psychobiosocial States Related to Performance Defined**

117 The concept of a psychobiosocial state (to be distinguished from biopsychosocial
118 approaches; Appaneal & Perna, 2014; Blascovich, 2008; Blascovich & Tomaka, 1996) draws
119 from the theoretical framework of the IZOF (Hanin, 2007, 2010), which underscores the
120 subjective experience of emotion. Psychobiosocial states are conceptualized as the
121 constellation of subjective experiences in which an individual's functioning is displayed. In
122 contrast to previous research, which mainly focuses on emotional intensity, the structure of
123 psychobiosocial states is described using the dimensions of form (display), content (type), and
124 intensity (quantity).

125 Psychobiosocial states have a multimodal display including affective, cognitive,
126 motivational, volitional, bodily, motor-behavioural, operational, and communicative state
127 modalities (Hanin, 2010; Ruiz et al., 2016). A central component of psychobiosocial states is
128 emotion or the subjective experience (feeling) conceptualized considering the interaction
129 between valence (pleasant vs. unpleasant) and performance functionality (functional vs.
130 dysfunctional). This interplay yields four types of states: pleasant-functional, unpleasant-
131 functional, pleasant-dysfunctional, and unpleasant-dysfunctional. The functionality of
132 psychobiosocial states is contingent on the individual interpretation of the own interaction
133 with the environment, perceived resources, and ability to cope. For instance, pleasant-
134 functional (e.g., feeling energetic before a competition) or unpleasant-functional (e.g.,
135 anxious) states can be helpful in mobilizing resources, while unpleasant-dysfunctional (e.g.,
136 sluggish) or pleasant-dysfunctional (e.g., complacent) states may reflect a lack of energy or
137 inability to mobilize resources. Emotions are triggered and modulated by one's actions, but at
138 the same time they also influence action regulation (Nitsch & Hackfort, 2016).

139 The performance functionality distinction is also applied to categorize the remaining
140 modalities of psychobiosocial states. The cognitive aspect relates to the ability (on the
141 functional side) or inability (dysfunctional) to attend to relevant stimuli and maintain the
142 concentration according to task demands. The motivational state modality manifests pre-
143 decisional processes related to choosing (or avoiding) a specific goal or course of action,
144 while the volitional modality involves post-decisional processes related to the mobilization of
145 (or lack of) resources or energy needed to complete the task. The biological component of
146 psychobiosocial states includes a bodily modality, or the psychophysiological aspects of
147 emotions related to activation (or deactivation), and a motor-behavioural modality that
148 involves the perception of movement and motor coordination efficiency (or inefficiency).
149 Finally, psychobiosocial states are also manifested in a social component, which involves
150 operational aspects or the perception of the effectiveness (or ineffectiveness) of task execution
151 and action, as well as a communicative modality that includes features related to the effective
152 (or ineffective) facets of the interaction with the members directly or indirectly involved in
153 the activity. All modalities of psychobiosocial states are interrelated. For instance, an athlete
154 may feel angry with herself (emotion modality) after a poor performance in the previous
155 rounds of a competition, as she thinks she has underperformed. Leading to the next round, she
156 may feel alert (cognitive), motivated to do better (motivational), and determined to reach her
157 goal (volitional). Additionally, she may feel energetic (bodily), powerful (motor-behavioural),
158 and skilful (operational). She may also feel supported by her coach and teammates
159 (communicative). An extensive body of work supports this conceptualization (for reviews, see
160 Hanin, 2000; Ruiz et al., 2017).

161 Psychobiosocial states are an integral component of the performance process implying
162 a bi-directional relationship. This idea concurs with the action-theory perspective (Nitsch &
163 Hackfort, 2016). Particularly, psychobiosocial states influence performance, while ongoing

164 performance influences psychobiosocial states. The first effect entails a ‘signal’ function to
165 the individual regarding the own state and consequences, while the second effect involves a
166 ‘regulatory’ function on the own states. The functionality of pleasant and unpleasant
167 psychobiosocial states depends on their content and intensity, which result from one’s
168 appraisals of the interaction with the environment, own resources, and capability to deal with
169 situational demands (Robazza & Ruiz, in press). Athletes’ preperformance states provide
170 information about the meaning of the situation, resources available, and options of self-
171 regulation. Drawing on the cognitive-motivational-relational theory (Lazarus, 2000), the
172 IZOF model assumes that before performance the athlete’s appraisals of the anticipated gains
173 or losses trigger challenge or threat states, respectively. For instance, when a situation is
174 appraised as an anticipated gain or challenge, the athlete’s states (e.g., feeling confident) can
175 signal that there are enough resources, and the situation ahead can be handled effectively.
176 Ongoing evaluations of performance provide information regarding the generation and
177 optimal use of resources (e.g., effort, concentration) for the task at hand or for future
178 accomplishments. In the IZOF model, performance is predicted based on the interaction of
179 functional and dysfunctional states, which can have a beneficial and/or detrimental influence.
180 A high probability of optimal performance is expected when the athlete experiences intense
181 functional psychobiosocial states and low levels of dysfunctional states. This combination is
182 predicted to promote high energy mobilization and optimal use of energies. Conversely, high
183 probability of poor performance is expected when the athlete experiences high intensity of
184 dysfunctional psychobiosocial states and low levels of functional states.

185 **Assessment of Psychobiosocial States**

186 The interaction between athletes’ functional and dysfunctional psychobiosocial states
187 is the foundation in the prediction of performance and in the regulation of such states. The
188 first step in the prediction and regulation of athletes’ experiences is based on an accurate

189 assessment. The literature on the emotion measurement is dominated by the use of self-reports
190 of subjective experiences, which typically neglect individual differences in the experience and
191 interpretation of these experiences. An assessment procedure that allows for the examination
192 of athletes' idiosyncratic experiences is the individualized profiling of psychobiosocial states
193 (IPPS; Ruiz et al., 2016). Grounded in the IZOF model, IPPS extends individualized emotion
194 profiling (IEP; Hanin, 2000) to assess all psychobiosocial states modalities (i.e., affective,
195 cognitive, motivational, volitional, bodily, motor-behavioural, operational, and
196 communicative) so far conceptualized as associated with sports performance. Regarding the
197 psychobiosocial states affective modality, valence and performance functionality are
198 considered descriptive features of the athletes' individual experiences associated with their
199 performance. Thus, and in line with previous IZOF-based research, IPPS measures four types
200 of emotions (i.e., pleasant-functional, unpleasant-functional, unpleasant-dysfunctional, and
201 pleasant-dysfunctional states). Performance functionality is applied to the remaining state
202 modalities. In total, IPPS contains 20 rows of items each formed of a list of synonym
203 descriptors (3-4 per row). The affective modality includes six types of items measuring
204 (functional and dysfunctional) pleasant, anxiety-related, and anger-related states. The other
205 modalities are measured using two rows of items (one for functional and one for
206 dysfunctional items).

207 Two standardized versions of the instrument exist for inter-individual comparisons.
208 One measures athletes' state experiences, called the psychobiosocial states scale (PBS-S;
209 Ruiz, Robazza, Tolvanen, & Hanin, 2018), and the other measures athletes' trait-like, more
210 stable patterns of experiences (PBS-ST; Robazza, Bertollo, Ruiz, & Bortoli, 2016). These
211 assessment procedures have been used to measure the content, intensity, and perceptions of
212 the functional impact of athletes' states accompanying recalled most and least successful
213 performances (Middleton, Ruiz, & Robazza, 2017; Mueller, Ruiz, & Chroni, 2018; Ruiz et

214 al., 2016), as well as actual experiences in practice settings (Ruiz, Haapanen, Tolvanen,
215 Robazza, & Duda, 2017) and in competition settings (Robazza et al., 2018). Currently,
216 versions of the measure exist in English, Finnish, and Italian language. Additionally, a scale
217 has been developed to assess psychobiosocial states in physical education (Bortoli, Vitali, Di
218 Battista, Ruiz, & Robazza, 2018).

219 **Regulation of Psychobiosocial States and Optimization of Performance**

220 Being able to attain an optimal emotional state and maintain it is important to achieve
221 and sustain consistent performance in training and competition. For instance, athletes may
222 engage in self-regulation strategies aiming at dealing with adverse situations and the states
223 associated with such situations. In this section, we conceptualize self-regulation and
224 emotional regulation. We then describe a model aimed to optimize performance based on self-
225 regulatory strategies targeting psychobiosocial states and action. Finally, we provide some
226 guidelines for future research.

227 **Self-regulation.** Self-regulation consists of the individuals' efforts to manage internal
228 states, involving thoughts, feelings, and actions, or the interpersonal processes planned and
229 adapted to the achievement of personal goals (Baumeister, Vohs, & Tice, 2007; Zimmerman,
230 2006). It is through self-regulation that individuals may become active managers of their
231 emotions and actions in emotion-inducing situations. The self-regulation of action is often
232 referred to as self-regulation, while the self-regulation of emotion is referred to as emotion
233 regulation (Koole, Van Dillen, & Sheppes, 2011). Self-control, often used interchangeably
234 with self-regulation, is the conscious and effortful form of self-regulation, which involves the
235 deliberate efforts aimed at inhibiting, overriding, and altering dominant responses with the
236 purpose of achieving a goal (Baumeister et al., 2007). For example, an athlete that continues
237 competing after feeling intense pain caused by a hard encounter with an opponent is engaged
238 in self-control.

239 Research using the strength model of self-control indicates that self-regulation draws
240 on a limited but renewable resource, referred to as self-control strength, which is depleted
241 when an individual engages in prior voluntary acts of self-control (for a review, see Englert,
242 2016; Muraven & Baumeister, 2000). One explanation of this limitation is the reduction of
243 glucose levels as the primary energy source of the brain (Ampel, Muraven, & McNay, 2018;
244 Gailliot & Baumeister, 2007). Beedie and Lane (2012), however, have questioned this
245 explanation, suggesting a resource-allocation model in which glucose is a mediator of
246 motivational and behavioural processes involved in self-control. Different hypothetical
247 relationships between glucose levels, appraisals of a task, and motivation have been proposed.
248 For instance, an individual with enough glucose levels, who appraises a need to exert self-
249 control will be sufficiently motivated to attempt self-control. In contrast, when a performer
250 does not have enough glucose levels (perhaps due to prior self-control), but appraises the need
251 to exert self-control, a motivational or emotional response (e.g., anxiety) can arise leading to
252 the release of liver glucose and involvement of brain areas responsible for self-control. In
253 extreme situations, when an intense emotional experience (e.g., rage) requires repeated self-
254 control attempts, other processes (e.g., concentration) taking place to respond to the situation
255 can compete with self-control for glucose and therefore result in depletion of resources and
256 ineffective adaptation.

257 **Emotion-regulation.** Emotion regulation refers to the process by which an individual
258 modifies the type of emotions experienced, their intensity, and duration (Peña-Sarrionandia,
259 Mikolajczak, & Gross, 2015). Individuals may engage in emotion regulation for three
260 purposes. Down-regulation processes aim at an exit of an emotional state or decreasing its
261 intensity. In contrast, maintenance processes aim to keep emotional intensity stable over time.
262 Up-regulation processes may increase the intensity of emotional experiences. Hackfort (1999)
263 distinguished emotion regulation from emotion control and emotion modulation. According to

264 this view, emotion regulation is based on feedback processes targeting a specific emotion or
265 emotion component (e.g., physiological arousal) and resulting in a reduction or intensification
266 of physiological arousal or activation. Emotion control, on the other hand, refers to a
267 purposeful induction or reduction of a certain emotion through organized procedures (e.g.,
268 anxiety control strategies) having a monoemotional and quantitative (intensity) orientation.
269 Finally, emotion modulation is contended to have a multiemotional (i.e., several emotions)
270 and multicomponential (i.e., physiological, cognitive, and feeling) orientation.

271 Lazarus and Folkman (1984) defined coping as the “constantly changing cognitive and
272 behavioural efforts to manage specific external and/or internal demands that are appraised as
273 taxing or exceeding the resources of the person” (p.141). Coping is concerned with exiting or
274 decreasing unpleasant or stress-related experiences, and thus, is considered a form of emotion
275 self-regulation (down-regulation). It has received a substantial amount of research attention
276 (Devonport, 2011; Nicholls, 2010; Thatcher, Jones, & Lavalley, 2012). Lazarus and Folkman
277 (1984) distinguished two forms of coping—problem-focused coping is directed at managing
278 or changing the stress-eliciting situation, whereas emotion-focused coping, which is likely to
279 occur when the individual appraises that the stress-causing situation cannot be changed,
280 involves the reduction of the emotional distress associated with the situation. For example,
281 not looking at the draws until finishing with the warm-up can be a form of problem-focused
282 coping for an athlete, whereas trying to relax to reduce the anxiety after knowing the
283 opponent is a form of emotion-focused coping. So, while coping is always an attempt to
284 reduce unpleasant emotions, emotion regulation can be directed to increase or decrease
285 pleasant and unpleasant emotions that are functional for performance.

286 Emotion regulation is assumed to serve hedonic or instrumental goals (Tamir, 2009).
287 The former refers to the need to promote pleasure and prevent pain through the down-
288 regulation of unpleasant emotions and up-regulation of pleasant emotions, while the latter

289 refers to the regulation of emotional experiences with the purpose of achieving a goal. An
290 athlete practicing deep breathing to decrease feelings of unpleasant anxiety and calm down
291 prior to competition is engaged in hedonic emotion regulation. However, in the sporting
292 context there are situations in which an athlete can deliberately seek to increase the intensity
293 of unpleasant emotions (e.g., anger) to generate an additional source of energy needed to
294 accomplish a task (e.g., score a point). This is an example of instrumental emotion regulation.
295 Research indicates that individuals engage in emotion regulation to evoke and maintain
296 specific emotions they believe helpful to achieve a goal (Hanin, 2010; Lane, Beedie,
297 Devonport, & Stanley, 2011).

298 There are several emotion regulation strategies. The process model of emotion
299 regulation (Gross, 2014), which draws on the work of Lazarus (2000) and Frijda (1986),
300 organizes emotion regulation strategies according to when they take place in the emotion
301 process. The model assumes that when individuals enter a particular situation and pay
302 attention to certain aspects of such situation, their appraisal triggers specific emotional
303 responses that involve physiological changes, subjective feelings, and specific tendencies to
304 act. Two types of emotion regulation strategies are distinguished. Antecedent-focused
305 strategies are employed before the emotion response is activated and are directed at changing
306 the emotional input before the emotion is experienced. Response-focused strategies take place
307 once the emotional response is generated and are intended to modify the emotional experience
308 or expression once they have been elicited.

309 There are four types of antecedent-focused strategies, which include situation
310 selection, situation modification, attention deployment, and cognitive change (Gross, 2014).
311 Situation selection strategy involves deciding not to enter an emotion-eliciting situation. An
312 example of such strategy would be an athlete who avoids performing the warm-up in front of
313 an audience or direct rivals. However, individuals may not always have control over the

314 situations they enter. In situation modification, the individual enters the situation, but takes
315 steps to change certain aspects to decrease its negative emotional impact or to facilitate a
316 desired emotional state. This strategy involves direct situation modification, which is similar
317 to problem-focused coping (Lazarus & Folkman, 1984), support seeking or conflict
318 resolution. Attentional deployment refers to individuals directing their attention towards
319 (concentration) or away (distraction) from specific aspects of the situation. For instance, prior
320 to shooting a penalty, a player may focus on his breathing and mentally recall a successful
321 shot, thereby ignoring the sounds of a hostile crowd. Lastly, cognitive change involves a re-
322 interpretation of the meaning that the individual has about the specific situation. A very
323 common cognitive change strategy is cognitive reappraisal that involves modifying the
324 thoughts about the emotion-eliciting situation or about the capacity to manage it, in a way that
325 changes its emotional impact. For instance, an athlete feeling too anxious after learning that
326 he will face the highest ranked opponent may interpret his anxiety as excitement. He can
327 therefore consider the situation an opportunity to test his skill level and learn from the
328 opponent, instead of thinking that he will lose and disappoint his coach and the team.

329 Response modulation strategies take place when an individual wants to change the
330 experience, physiology, and/or expressive aspects of an emotion that is already elicited. In
331 sport settings, the most common form of response modulation is arousal regulation using
332 techniques such as imagery or relaxation (Turner & Jones, 2018). Expressive suppression is
333 also a common strategy, which consists in inhibiting the outward expression of an emotional
334 experience. For example, a tennis player may suppress the urge to throw his or her racket after
335 making double fault. However, suppressing emotional expression is a resource demanding
336 activity possibly leading to negative consequences. For instance, a study by Wagstaff (2014)
337 indicated that participants who engaged in emotion suppression while watching a disgust-

338 eliciting video performed worse in a 10-km cycling time trial compared to participants who
339 did not engage in emotion suppression.

340 A meta-analysis of 306 studies indicated cognitive reappraisal as the most effective
341 strategy compared to response modulation or attentional deployment (Webb, Miles, &
342 Sheeran, 2012). Within attentional deployment strategies, distraction was found a more
343 effective way to regulate emotions than concentration. In addition, suppressing the emotional
344 expression was shown to be more effective than suppressing the experience or the thoughts
345 associated with the emotion-eliciting situation. This finding concurs with the notion of ironic
346 processes of mental control positing that attempts to influence mental states (e.g., experience
347 or thoughts) require monitoring processes that (ironically) act in the opposite direction of the
348 intended control (Wegner, 2009). In summary, the review shows that the effectiveness of
349 emotion regulation strategies is moderated by factors such as the type of emotion to be
350 regulated or the frequency with which the strategy is employed. Short lasting emotions (e.g.,
351 anger compared to sadness) are easier to regulate, and strategies the more are practiced, the
352 more effective they are. Despite substantial research evidence supports the process model in
353 general psychology, research examining the effects of interventions informed by this model in
354 sport is still scarce (McCormick, Meijen, Anstiss, & Jones, 2018).

355 The emotion regulation literature also distinguishes other two types of emotion
356 regulation. Intrinsic or intrapersonal emotion regulation is directed at the modification of
357 one's own emotions. The study of emotion regulation strategies that athletes engage in to
358 enhance their performance has received most research attention (Lane et al., 2016;
359 McCormick et al., 2018). In the sport setting, however, coaches, teammates, and other people
360 influence the emotional states and performance of athletes. Emotion regulation of others'
361 emotions, referred to as extrinsic or interpersonal emotion regulation (Rimé, 2007), is gaining
362 research attention (Campos, Walle, Dahl, & Main, 2011; Friesen et al., 2013). For instance, a

363 study by Friesen et al. (2018) indicated that the congruency of coach and athlete perceptions
364 between their desired emotions (emotions they wanted to feel prior to performance) and
365 emotions actually experienced were associated with better perceived performance. Research
366 also shows that athletes engage in emotion regulation strategies to influence their own
367 emotions and those of their teammates (Tamminen & Crocker, 2013).

368 Following the assumptions of the IZOF model (Hanin, 2000, 2007, 2010), the first
369 step in reaching an optimal state is being aware of the content and intensity of one's
370 emotional experiences and their influence on performance. Athletes and relevant people
371 involved (e.g., coaches) should be aware of functional and dysfunctional experiences, and the
372 impact of these experiences on their performance. Awareness can be increased by developing
373 profiles of individual functional and dysfunctional psychobiosocial states and patterns (Hanin,
374 2007), using the assessment procedures previously discussed. Competitive sport provides
375 repeated opportunities for athletes and coaches to reflect on psychobiosocial states and their
376 relationship with performance. The role of coaches in interpersonal regulation has received
377 scarce research attention. In an attempt to fill this gap in the literature, Mueller, Ruiz, and
378 Chroni (2018) examined the perception of coaches about functional and dysfunctional
379 psychobiosocial states of their players, and how they used such information in interpersonal
380 emotion regulation. Results indicated that coaches managed the expression or suppression of
381 their own emotional states to regulate those of the players. For instance, coaches used emotion
382 expression to amplify the pleasant states of players and to reassure them, and emotion
383 suppression to diminish the intensity or avoid their player's frustration and disappointment. In
384 addition, the players were aware of the coaches' strategies, which they perceived as helping
385 them and their performance. Coaches' ability to perceive their players' feeling states and an
386 effective use of emotion regulation strategies can also serve to enhance the coach-athlete
387 relationship (Davis & Davis, 2016).

388 A key concept for emotion regulation is meta-experience. In the IZOF model, the
389 concept of meta-experience goes beyond categorizing oneself in a particular state, such as
390 afraid, angry, or happy. Meta-experiences refer to the individual's knowledge, attitudes, and
391 preferences towards one's own specific experiences (Hanin, 2000). Meta-experiences are
392 typically developed from a constant evaluation of past performances and the functional
393 impact of subjective experiences, and play an important role in self-regulation. For example,
394 an athlete who is aware that in most previous successful performances she has felt anxious,
395 may develop a positive attitude towards pre-competitive anxiety, and thus may not engage in
396 its down-regulation. Coaches can play an important role in helping athletes develop realistic
397 meta-experiences. Coaches, however, need to know their athletes, how they are feeling and
398 reacting, and how these feelings influence their performance. Sport psychology practitioners
399 can also be very instrumental in this process.

400 Regulation also involves the acceptance of the emotional experiences and their
401 functional or dysfunctional impact. Acceptance is considered a key component of
402 mindfulness, resulting in a reduction of avoidance tendencies (Moore, 2016). A mindful and
403 acceptance attitude is expected to be more effective in improving the own relationship with
404 internal experiences (i.e., cognitions, emotions, and physiological reactions) in comparison
405 with attempts to modify them (Gardner, 2016). Athletes who have accepted their experiences
406 and the impact that these have on their performance are a step closer to change or to engage in
407 some sort of regulation strategy. The opposite, athletes resisting their feelings or associated
408 thoughts, may reflect lack of motivation for change or even lead to ironic processes (Wegner,
409 2009) and expenditure or depletion of resources.

410 The final step involves the implementation of emotion regulation strategies.
411 Individualized emotion regulation strategies may target the content, intensity, frequency, and
412 duration of psychobiosocial states. Interventions aiming to regulate a range of

413 psychobiosocial state modalities are expected to be more effective than intervention programs
414 including only one modality. For example, Robazza, Pellizzari, and Hanin (2004) developed
415 an individualized psychological skills training program that targeted the content and intensity
416 of precompetition emotional and bodily state modalities in roller-skating hockey players and
417 gymnasts. Such intervention included, and developed when needed, successful strategies that
418 already existed in the athletes' repertoire. More recently, self-regulation strategies of the
419 whole range of psychobiosocial states were effectively implemented in swimmers'
420 preperformance routines together with the use of music (Middleton et al., 2017).

421 A more comprehensive approach, however, involves the regulation of psychobiosocial
422 states (including emotion and non-emotion modalities) as well as performance or action
423 patterns. Thus, a combination of regulation strategies targeting emotion and action patterns is
424 expected to be more effective in improving performance consistency (Bortoli et al., 2012;
425 Hanin & Hanina, 2009; Hanin, Hanina, Šašek, & Kobilšek, 2016).

426 **Optimization of Performance: The Multi-Action Plan (MAP) model** . The multi-
427 action plan (MAP; Bortoli et al., 2012; Robazza et al., 2016) theoretical framework was
428 developed as an action-oriented intervention that extends the IZOF model and its focus on
429 subjective emotional experiences. The MAP model uses a 2×2 interaction of action control
430 (high vs. low) and emotional valence (pleasant vs. unpleasant) to categorize four types of
431 performance. A so called Type 1 optimal-automatic performance state is characterized by
432 functional pleasant states experienced prior to or during task execution. These functional
433 pleasant states result from athletes' appraisals of an anticipated gain (challenge). Feeling
434 confident, in control, energized, and having enough resources to accomplish the task are
435 typical of Type 1 performance, which is alike to an ideal state (Unesthåll, 1986) or flow
436 experience (Jackson & Csikszentmihalyi, 1999). Athletes have an appropriate focus of
437 attention, task execution seems automatic and it requires minimal conscious control.

438 According to the MAP model, optimal performance can also occur under controlled attention
439 to consciously monitor (supervise) the correct movement execution and prevent a
440 dysfunctional step-by-step control of the action (van Ginneken, Poolton, Masters, Capió, Kal,
441 & van der Kamp, 2017). A Type 2 optimal–controlled performance state may involve the
442 experience of functional unpleasant states, and can occur under novel or stressful situations.
443 Athletes’ functional unpleasant or “emergency” states (e.g., anxiety, anger) are associated
444 with high action tendencies, and signal a need to use compensatory resources to execute the
445 task, including a higher focus of conscious monitoring. In such cases, reinvesting attention to
446 skill components is likely (Masters & Maxwell, 2008). Reinvestment, however, can facilitate
447 movement execution as long as the athlete is able to focus on one or a few core components
448 of the action. This type of reinvestment is expected to facilitate voluntary action monitoring,
449 keep the flow of the movement, and prevent disruption of automated processes. This action-
450 centred self-regulation requires a previous identification of core movement components,
451 namely, those parts of the action that are not completely automated and are therefore
452 subjected to variations, particularly when performing under pressure. Athletes can also move
453 from Type 2 (controlled) performance to Type 1 (automatic) performance with the help of
454 emotion regulation strategies (Robazza et al., 2016).

455 The MAP model also considers two types of suboptimal performance. A Type 3
456 suboptimal over-controlled performance state usually involves athletes’ experiencing
457 dysfunctional unpleasant states. Athletes’ appraisals of occurred harm result in a tendency to
458 suppress undesired thoughts and unpleasant emotions (e.g., dejection), and an excessive
459 attention focus on task execution (“trying too hard”) or a focus on irrelevant cues. This state
460 leads to an over controlled task execution and movement disruption. Both emotion- and
461 action-centred regulation strategies can help the performer regain and optimal performance
462 state. A Type 4 suboptimal under-controlled performance state may involve the experience of

463 dysfunctional pleasant states resulting from athletes' appraisals of benefit before the task is
464 finished. These appraisals result in feeling too good (e.g., complacency) too early, which lead
465 to a lack of task-involvement or minimal conscious focus of attention and inability to recruit
466 necessary resources to accomplish the task. Again, both emotion- and action-centred
467 regulation with a focus on core action components can be helpful (Bortoli et al., 2012;
468 Robazza et al., 2016). Thus, emotion- and action-centred self-regulation strategies, used
469 separately or in combination, are recommended for optimal performance. To deal with
470 dysfunctional states (unpleasant and pleasant), athletes should be aware of and accept their
471 states and the situation, focus on the present moment, and engage in emotion- and/or action-
472 centred strategies (Bortoli et al., 2012; Middleton et al., 2017; Robazza et al., 2016; for a
473 review, see Robazza & Ruiz, 2018).

474 **Conclusions**

475 This chapter outlines the importance of considering individual differences in the
476 assessment and regulation of athletes' subjective emotional experiences. Athletes' awareness
477 and acceptance of the own functional and dysfunctional psychobiosocial states, which
478 comprise emotion and non-emotion components, are crucial for the regulation of such states
479 behaviour, and performance. The use of self-report instruments sensitive to the individual
480 nature of experiences can serve as catalyst for discussion with athletes and enhance their self-
481 awareness. Several emotion regulation strategies exist, and have been categorized based on
482 when they take place in the emotion process. Individualized intervention programs including
483 strategies aimed at the regulation of several components of athletes' psychobiosocial states
484 are suggested rather than targeting a single modality. Together with emotion-centred
485 strategies, action-centred strategies are also recommended, thus taking a more comprehensive
486 approach for performance optimization.

487 Future Research Directions

488 Future research and applications should address three main themes. The first main direction
489 involves the use of technology in the assessment of athletes' states including, for example,
490 video recordings of specific situations to access athletes' emotion related information in real
491 performance settings (Friesen et al., 2018; Hackfort & Schlattmann, 1991; Martinent, Ledos,
492 Ferrand, Campo, & Nicolas, 2015). For instance, Martinent et al. (2015) used continuous
493 video recordings of table tennis players' actions and contextual information as stimulus to
494 help players identify emotions experienced during competition. Similarly, Friesen et al.
495 (2018) used video recordings of karate matches to assist athletes and their coach identify the
496 emotions the athletes had experienced and those they desired they had experienced. This
497 methodology has proven to be an effective tool to examine intra-personal and interpersonal
498 emotion regulation strategies. Thus, further research utilizing technology to assess athletes'
499 emotional experiences and self-regulation strategies is warranted.

500 Athletes experiences involve several modalities, thus, the second main research
501 direction includes the combination of physiological, psychological, and behavioural measures.
502 In a recent study, Robazza et al. (2018) examined psychobiosocial states, cognitive functions,
503 endocrine responses (i.e., cortisol and chromogranin A), and performance in a team of
504 orienteers. An interesting approach includes the assessment of brain activity and neural
505 efficiency during performance in actual settings (Bertollo et al., 2016). Given that athletes'
506 feeling states associated with performance are multimodal, it seems sensible to include
507 psychophysiological and behavioural data.

508 Finally, integrating several types of data also calls for the combination of theoretical
509 frameworks. As in the Robazza et al. (2018) study, which incorporated the IZOF (Hanin,
510 2007) and biopsychosocial (Blascovich, 2008; Blascovich & Tomaka, 1996) models, it is our
511 contention that an integration of different perspectives can improve our understanding of

- 512 athletes' experiences and better inform research and applied interventions aimed at self-
- 513 regulation of emotional, cognitive, and behavioural processes.

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Table 1. Selected theories on the relationship between emotion-related constructs and athletic performance.

Focus	Theory/Model/Hypothesis	Setting	Proposal	Assessment Methods
Arousal	Drive theory (Hull, 1943; Spence & Spence, 1966)	Mainstream	Positive linear relationship between arousal and performance for well-learned tasks	Not tested
	Inverted-U hypothesis (based on Yerkes & Dodson's Law, 1908)	Mainstream	Peak performance at a moderate level of arousal	Not tested
	Reversal theory (Hudson, Males, & Kerr, 2016; Kerr, 1985)	Mainstream	Individuals in telic state prefer to experience low arousal, while individuals in paratelic state prefer high arousal. Optimal performance when motivational dominance, physiology, and sport type are aligned	Telic State Measure (TSM; Svebak & Murgatroyd, 1985)
	Biopsychosocial model of arousal regulation, later referred to as challenge and threat model (Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004; Blascovich & Tomaka, 1996)	Mainstream	Challenge and threat states result in increased sympathetic–adrenomedullary (SAM) activity, with threat states also linked to increased pituitary–adrenocortical (PAC) activity inhibiting vasodilation	Cardiovascular measures (e.g., heart rate, ventricular contractility, cardiac output)
Anxiety	Cusp catastrophe model (Fazey & Hardy, 1988)	Sport-specific	When cognitive anxiety is low there is an inverted-U relationship between physiological arousal and performance, whereas when cognitive anxiety is high performance improves to a critical point after which a sudden decline occurs	Competitive State Anxiety Inventory-2 (CSAI-2; Martens, Burton, Vealey, Bump, & Smith, 1990)
	Multidimensional anxiety theory (Martens et al., 1990)	Sport-specific	Inverted-U relationship in performance-somatic anxiety relationship, while cognitive anxiety is negatively related to performance	CSAI-2 (Martens et al., 1990)

	Directionality approach (Jones, Hanton, & Swain, 1994)	Sport-specific	Athletes with positive expectancies in coping ability and goal attainment interpret anxiety symptoms as facilitative for performance, whereas those with negative expectancies interpret their symptoms as debilitating	CSAI-2 (Martens et al., 1990), State-Trait Anxiety Inventory (STAI; Spielberger, Gorsush, & Lushene, 1970)
	Attentional control theory (Eysenck & Wilson, 2016)	Mainstream	Anxiety impairs processing efficiency by consuming attentional resources, increasing distractibility, and attention to threat-related stimuli	State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970)
	Reinvestment theory (Masters & Maxwell, 2008)	Sport-specific	Poor performance results from athletes trying to consciously control the execution of a motor skill with declarative knowledge	Movement specific reinvestment scale (Masters & Maxwell, 2008)
Mood	Mental health model (Morgan, 1985)	Mainstream	Superior performance associated with intense vigor and low tension, depression, anger, fatigue, and confusion (iceberg profile)	Profile of Mood States (POMS; McNair et al., 1971)
	Conceptual model of mood-performance relationships (Lane et al., 2017)	Mainstream, adapted to sport	Vigor facilitates performance; confusion and fatigue debilitate performance; anger and tension are helpful in absence of depression, and harmful in presence of depression	Brunel Mood Scale (BRUMS; Terry, Lane, Lane, & Keohane, 1999; Terry, Lane, & Fogarty, 2003)
Multiple emotions	Individual zones of optimal functioning model (Hanin, 2000)	Sport-specific	Optimal performance associated with intense functional states including emotions (pleasant and unpleasant) and low levels of dysfunctional states and emotions via energy mobilization and organization. Poor performance associated with the opposite	Individualized emotion profiling (IEP; Hanin, 2000), Individualized Profiling of Psychobiosocial States (Ruiz et al., 2016)

Cognitive motivational-relational theory (Lazarus, 2000)	Mainstream	Each emotion influences performance differently, usually via appraisals of anticipated gains (i.e., challenge) or losses (i.e., threat) that lead to changes in motivation and coping attempts. These changes have specific action tendencies, and physiological and behavioral consequences (e.g., skilled performance)	Not tested
Theory of ironic processes of mental control (Wegner, 2009)	Mainstream	Unwanted emotions (e.g., worry, fear, anxiety) associated with harmful thoughts that individuals aim to suppress recur after suppression producing counter-intentional (ironic) effects	Not specific
Theory of challenge and threat states (Jones, Meijen, McCarthy, & Sheffield, 2009)	Sport-specific	Challenge states associated with increased SAM activity, emotions perceived as helpful, and superior performance compared to threat states	Psychophysiological measures (cardiovascular markers) and emotion measures (SEQ; Jones et al., 2005)
Multi-action plan model (Bortoli et al., 2012; Robazza et al., 2016)	Sport-specific	Interaction between emotion valence and control results in four types of performance: <i>optimal-automatic performance</i> (functional pleasant emotions and low control); <i>optimal-controlled performance</i> (functional unpleasant emotions and high control); <i>suboptimal-effortful performance</i> (dysfunctional unpleasant emotions and high control); <i>suboptimal-automatic performance</i> (dysfunctional pleasant emotions and low control)	Core action elements, perceived accuracy, and perceived control ratings on modified Borg (2001) scale