

28 **Abstract**

29 Within this paper, we provide an expert opinion on five evidence-based psychological
30 strategies that could help endurance participants overcome slowing down and stopping
31 during performance: goal setting, motivational self-talk, relaxation, distraction, and
32 pacing. We argue that these strategies are well-suited for delivery as brief-contact,
33 educational interventions that could be accessible to large numbers of participants who
34 do not have access to a sport and exercise psychologist. These interventions could be
35 delivered using websites, online videos, workshops, or magazine articles. We propose a
36 novel use for implementation intentions (i.e., if-then planning) to develop endurance
37 participants' conditional knowledge of when to use specific strategies. In addition,
38 although research evidence suggests that these psychological strategies may be
39 efficacious for overcoming thoughts of slowing down or stopping, there are important
40 limitations in the research evidence. In particular, there is a dearth of ecologically valid,
41 field-based effectiveness studies. Finally, we consider situations where attempts to resist
42 slowing down or stopping during endurance activity may not be advisable. Scenarios
43 include when there is an increased likelihood of injury, or when environmental conditions
44 increase the risk of life-threatening events.

45

46 **Keywords:** Brief-contact interventions; endurance performance; if-then planning;
47 psychological skills training; self-regulation.

48 **Endurance Activity and Resisting Slowing Down or Stopping**

49 Endurance activities involve performing continuous, dynamic, and whole-body exercise
50 tasks (e.g., running, cycling, swimming, rowing) over middle or long distances, at
51 submaximal intensities (McCormick et al., 2019). Sport (e.g., competitive cycling) and
52 exercise events (e.g., mass-participation running events) that involve endurance are
53 exceptionally popular (e.g., Scheerder et al., 2015), and include participants who range
54 from non-competitive and inexperienced levels through to competitive, elite athletes
55 (McCormick et al., 2020). Endurance participants and athletes often experience thoughts
56 about slowing down significantly (e.g., walking in a running event) or stopping (e.g.,
57 momentarily taking a break or quitting the event) during endurance activity (Buman,
58 Omli, et al., 2008; Cooper et al., 2020; Meijen et al., 2018; Schüler & Langens, 2007).
59 Although slowing down or stopping may seem rational behavioural responses to exertion,
60 pain, and discomfort, often such actions are unintentional and have unwelcome effects on
61 performance (Buman, Brewer, et al., 2008). Phenomenological accounts of participants
62 wanting to slow down or stop during endurance activity suggest that, although an
63 unpleasant experience, using specific psychological strategies can help participants resist
64 slowing down or stopping and maintain a higher level of performance (Buman, Brewer,
65 et al., 2008; Cooper et al., 2020).

66 This expert opinion paper is an output of a British Psychological Society Division
67 of Sport and Exercise Psychology funded Research Working Group. These Working
68 Groups “bring together experts from within a research area to foster greater collaboration”
69 and look to “progress a specific research area within sport and exercise psychology”
70 (British Psychological Society, 2021). The Working Group that wrote this opinion paper

71 has shared research expertise in the psychology of endurance performance and, within
72 this paper, aimed to progress research and practice in the endurance context.

73 As such, the purpose of this expert opinion paper is to provide an overview of
74 evidence-based psychological strategies that may help endurance participants to keep
75 going in circumstances where there is no apparent risk of injury, harm, or threat to life.
76 The chosen strategies were agreed based on critical discussion of the evidence base by
77 seven endurance psychology researchers in the Working Group. The Working Group
78 aimed to select and include research on strategies that met the following criteria:

- 79 • Psychological strategies
- 80 • Deliverable as brief-contact, educational interventions
- 81 • Grounded in good quality research evidence (e.g., see the systematic review by
82 McCormick et al., 2015)
- 83 • Likely to benefit athletes in the ‘real world’, and unlikely to harm (e.g., increase
84 risk of injury), when delivered as brief-contact, educational interventions

85 Consequently, we have confined our overview to *psychological* strategies rather
86 than including all interventions such as those deriving from ergogenic aids like caffeine
87 (see Southward et al., 2018 for a review) or behavioural interventions such as listening to
88 music (see Terry et al., 2020 for a review). The focus of this expert opinion paper is on
89 brief-contact, educational, psychological interventions (referred to as brief-contact
90 interventions) that can make evidence-based sport psychology more accessible and
91 implementable. We define brief-contact educational interventions as those providing
92 content that the user should be able to understand in a single session. The consultant’s
93 role is educational, and the intervention can be delivered by sport psychology trainees or
94 individuals with a strong grounding in sport psychology, such as individuals with a (Stage

95 1) master's degree in sport psychology. This makes brief-contact educational
96 interventions different from approaches such as solution-focused therapy, where although
97 the contact with the practitioner may be limited to one session (e.g., de Shazer et al., 2007)
98 it is expected that the provider of the solution-focused therapy is competent in a
99 counselling model of delivery, which can be expected of sport and exercise psychology
100 practitioners who have further training and experience (e.g., registered Sport and Exercise
101 Psychologists; British Psychological Society, 2018).

102 Psychological interventions can include teaching psychological strategies, where
103 endurance participants are educated about how the strategy can benefit them in the future
104 (Meijen, 2019). In this overview, when we use the term 'psychological strategies', we
105 refer to a single psychological technique (such as self-talk, goal setting) or a combination
106 of techniques, that can be used systematically to enhance a psychological skill such as
107 attention, coping, or confidence (see also Birrer & Morgan, 2010).

108 In terms of accessibility, we suggest that brief-contact interventions may benefit
109 endurance participants who do not have access to a sport psychology practitioner for
110 continued sport psychological support (McCormick et al., 2020); this is a consideration
111 particularly relevant to participants in mass-participation events (e.g., major city
112 marathons). Consequently, providing brief-contact interventions may reduce barriers to
113 psychological knowledge and support (Meijen et al., 2017). In terms of implementation,
114 we suggest that evidence-based, brief-contact interventions that require minimal time
115 may—within the sport psychology domain—provide a novel, practical, and wider-reaching
116 approach to positively impact endurance performance (McCormick et al., 2020). Before
117 we appraise brief-contact interventions that can be applied to endurance activity, we first

118 provide a short overview of why athletes might slow down or stop from a physiological
119 and psychological perspective.

120 **Stopping Endurance Exercise: Mind over Muscle?**

121 In exercise physiology, it has traditionally been assumed that highly motivated
122 people have to slow down or stop during endurance activity because their fatigued
123 neuromuscular system is no longer able to produce the desired power/speed required
124 despite a maximal voluntary effort (Allen et al., 2008; Hepple, 2002). However, in recent
125 years, this assumption has been challenged by studies demonstrating the existence of a
126 significant neuromuscular and bioenergetic reserve after exhaustive endurance exercise
127 (Cannon et al., 2016; Marcora & Staiano, 2010; Morales-Alamo et al., 2015; Staiano et
128 al., 2018). These findings suggest that even highly motivated people reach their
129 “psychological limit” before reaching the limit of their physiological capacity, as
130 originally proposed by Ikai and Steinhaus (1961). More recently, it has been proposed
131 that highly motivated people stop when they perceive their effort as maximal and when
132 continuation of endurance exercise at the desired power/speed seems impossible
133 (Marcora & Staiano, 2010; Staiano et al., 2018). As such, perception of effort is
134 considered a key psychological variable for pacing-related decisions because it is
135 associated with the time people can (or estimate they can) continue to perform endurance
136 exercise at a given intensity (Coqart et al., 2012; Horstman et al., 1979). Perception of
137 effort is also sensitive to a variety of factors known to influence the capacity of humans
138 to sustain endurance exercise. These factors include physical training (Ekblom &
139 Goldberg, 1971), muscle fatigue (Marcora et al., 2008), environmental conditions (Levine
140 & Buono, 2019), mental fatigue (Marcora et al., 2009), and stimulants like caffeine
141 (Smirmaul et al., 2017). Furthermore, thoughts about slowing or stopping—termed a

142 psychological crisis in the endurance performance literature—may occur independently
143 of physiological processes (e.g., due to boredom or self-doubt) and can be managed more
144 effectively using situationally-appropriate psychological strategies (Schüler & Langens,
145 2007). Therefore, psychological interventions can improve endurance performance by
146 changing how participants perceive their effort, manage discomfort, and regulate their
147 responses to psychological crises to cope with the demands of endurance activity
148 (McCormick et al., 2015).

149 **Brief-Contact, Educational Interventions**

150 Our approach in this paper reflects a psychological skills training model of
151 practice (rather than a counselling or medical model of practice), where the consultant
152 role is educational (rather than clinical), and where the intervention goals or focus broadly
153 relate to the development of psychological skills and benefits to performance (e.g.,
154 improving performance time or satisfaction with performance, Poczwadowski et al.,
155 2004). In the context of this opinion paper, we propose that brief-contact, educational
156 interventions consist of psychological strategies delivered in a manner that are easy to
157 learn and subsequently implement. We suggest that brief-contact educational
158 interventions provide content that the user should be able to understand in a single
159 psycho-educational session.

160 Brief-contact interventions can focus on changing thoughts and feelings
161 experienced during normal, everyday activities (Walton, 2014). As such, brief-contact
162 interventions can be underpinned by self-regulatory processes; that is, ‘self-generated
163 thoughts, feelings, and actions that are planned and cyclically adapted to the attainment
164 of personal goals’ (Zimmerman, 2000, p. 14). When individuals self-regulate, they plan,
165 execute their plans, and subsequently reflect on the effectiveness of those plans

166 (Zimmerman, 2000). These phases are referred to as the forethought, action, and
167 reflection phases of self-regulation (Zimmerman, 2000). Critically, effective self-
168 regulation requires knowledge of appropriate task strategies (i.e., evidence-based
169 psychological strategies to overcome unhelpful thoughts and behavioural urges) and
170 conditional knowledge of when to use them (Brick et al., 2016; Cleary et al., 2006). In
171 this regard, recent evidence with beginner endurance participants suggests that
172 declarative, procedural, and conditional knowledge of psychological strategies is mostly
173 acquired from other athletes and coaches (Brick et al., 2020). Thus, coupled with a lack
174 of access to sport and exercise psychologists (McCormick et al., 2020), consultancy
175 models focused on establishing a relationship, identifying and formulating the needs of
176 the client, delivering an intervention, and evaluating the service (e.g., Keegan, 2016) may
177 be less likely to reach and benefit this population. Consequently, we feel it is important
178 to draw attention to brief-contact interventions relevant to endurance contexts that are
179 time-limited, action-oriented, and can be shared by people who are not accredited sport
180 and exercise psychologists, including trainee practitioners and appropriately trained
181 coaches, sport scientists, and sport therapists (Giges & Petitpas, 2000; Meijen et al.,
182 2017).

183 There are a variety of ways to deliver brief educational interventions for
184 endurance participants. Coaches, sport scientists, or sport therapists might include
185 relevant content during face-to-face individual sessions. In addition to these modes of
186 delivery, sport and exercise psychologists may also include content more widely online
187 (e.g., website articles, videos), in print (e.g., magazine articles), and through group
188 workshops (Cotterill & Symes, 2014), and make these resources available to use by
189 coaches, sport scientists, sport therapists, and endurance participants. Brief-contact

190 interventions have also been delivered using a ‘psyching team’ model involving group
191 workshops and the provision of brief one-to-one support. Psyching teams originated in
192 Northern America and assist endurance participants prior to, during, and/or after mass-
193 participation endurance events through mental skills support (Gibbs-Nicholls et al., 2022;
194 Hays & Katchen, 2006; Meijen et al., 2016). Importantly, these different options
195 complement each other by catering for different participant preferences (McCormick et
196 al., 2020). Moreover, exposing endurance participants to sport psychology may initiate
197 subsequent one-to-one consultancy (Hays & Katchen, 2006) through increased visibility
198 of sport psychology. As such, we do not suggest that brief-contact interventions *replace*
199 individual sport psychology support, but instead can provide a useful *additional* mode of
200 providing sport psychology information in contexts where the support required is
201 performance-driven and non-clinical in nature.

202 The provision of easily accessible sport psychology information as brief-contact
203 interventions is intuitively appealing. Nevertheless, there remains a need to demonstrate
204 efficacy and effectiveness, and to develop evidence-based resources for intervention
205 content. This is particularly the case for online, social, and print media sources, where
206 non-evidence-based, pseudoscientific misinformation may be prevalent (Bailey et al.,
207 2018). This issue can impact on the quality of intervention content, particularly for sports
208 coaches who commonly use online sources to obtain information about psychological
209 strategies and ‘tips’ (Pope et al., 2015). Similarly, recreational endurance participants
210 have reported a preference for psychological guidance provided through online sources
211 as well as through sport-specific magazines, through their coach, and through event
212 organisers (McCormick et al., 2020). Consequently, we will also critique the evidence for
213 the ‘real-life’ effectiveness of psychological strategies to overcome slowing down and

214 stopping during endurance activities. Next, based on the expertise of the working group
215 and the criteria set out at the start of this paper, we turn our attention to five evidence-
216 based psychological strategies deliverable as brief-contact, educational interventions:
217 goal setting, motivational self-talk, relaxation, distraction, and pacing, judgement and
218 decision-making. After outlining these psychological strategies, we propose that
219 implementation intentions (i.e., if-then planning) could be used to develop endurance
220 participants' conditional knowledge of when to use specific strategies.

221 **Goal Setting**

222 Most endurance participants appear to engage in goal setting to some extent
223 (Weinberg, 1999). Indeed, it is common for endurance participants to set performance-
224 focused goals to improve, such as completing an event in a personal best time (Hardy &
225 Nelson, 1988; Martin & Gill, 1995; Masters & Ogles, 1998; Ogles & Masters, 2003), and
226 there is experimental evidence for the benefits of this in research involving self-paced
227 (Tenenbaum et al., 1999) and incremental endurance tasks (Theodorakis et al., 1998).
228 Other types of goals typically adopted are outcome goals (e.g., finishing in the top three
229 positions) and process goals (e.g., focused on implementing skills and strategies).

230 Setting goals can benefit endurance participants by increasing motivation and
231 directing attention. As such, goals play an important role in the regulation of behaviour
232 (Locke & Latham, 1985) and are an essential component of effective self-regulation
233 (Zimmerman, 2000). Goals can, however, also act as stressors (Burton & Naylor, 2002).
234 Specifically, perceived goal difficulty can impact pre-competition states and more
235 difficult goals have been associated with higher pre-competition anxiety in swimming
236 (Hanton & Jones, 1995), middle distance running (Jones et al., 1990), duathlon (Lane et
237 al., 1995a), and triathlon (Lane et al., 1995b) events. Furthermore, goal setting guidelines

238 suggest that goals should be challenging, yet attainable (Locke & Latham, 1985). The line
239 between attainable and unattainable can be fine, however. Specific to endurance
240 performance, Burdina et al. (2017) noted that when runners went up an age category
241 (specifically runners who moved into the 45-49 and 50-54 age groups), and thus had a
242 challenging, yet more attainable goal to aim for in qualifying for a major marathon
243 (Boston), they seemingly performed better. Thus, it is relevant to consider how to address
244 the setting of goals that are potentially too challenging.

245 It is also common for individuals to have a time-based (performance) goal (Scholz
246 et al., 2008), that often reflects a personal best, that is, their best ever achievement.
247 Performance goals can be beneficial to shape the training required to achieve a standard;
248 setting the sessions and identifying how a session will be evaluated, for example. This is,
249 however, less useful on race day as an excessive focus on performance goals can take the
250 focus away from the task at hand (i.e., process goals) and does not easily allow for
251 adaptability to changing conditions. Weather conditions, such as high temperatures, for
252 example, have been found to negatively affect goal attainment (Markle et al., 2018). To
253 allow for more flexibility (Gould, 2010), endurance participants can instead plan for more
254 adaptability in their goals, which could involve evaluating the conditions on the day and
255 setting different levels of goals. For example, they can set a ‘dream goal’, which is
256 achievable when the conditions on the day are perfect, a ‘happy goal’ for when conditions
257 are less than optimal, and an ‘acceptable goal’ (i.e., a bare minimum) for when
258 circumstances are not as expected (Day, 2019; Markle et al., 2018; Meijen et al., 2017).
259 On race day, this can reduce pressure when individuals feel that their goal is being
260 threatened (Uphill & Jones, 2007), and help control negative thoughts (e.g., of slowing
261 or stopping), and unhelpful emotional responses such as disappointment (Gaudreau et al.,

262 2002; Meijen et al., 2017). In this context, ‘open goals’, such as ‘see how fast I can run
263 5km’ (Swann et al., 2020) can be considered and there is some initial evidence from the
264 physical activity domain to suggest that open goals may facilitate favourable perceptions
265 of performance (Hawkins et al., 2020; Swann et al., 2020). Thus, setting adaptable goals
266 may alleviate performance pressure and benefit participants’ well-being. This is
267 especially important given the link between setting unattainable goals and lower well-
268 being (Nicholls et al., 2016). To illustrate, Beedie et al. (2012) found that when research
269 participants were deceptively informed that they were behind their performance goal, they
270 experienced unpleasant emotions and negative thoughts as a result. However, when the
271 same participants were deceptively informed that they were ahead of their goal, they
272 experienced more pleasant emotions and positive thoughts. An important aspect of this
273 process is that endurance participants make decisions on the relative difficulty of
274 achieving the goal without detail of course condition, which has an impact on pacing
275 decisions. Ensuring flexibility is therefore a key aspect when setting a performance
276 standard as a goal.

277 As such, we propose that brief-contact goal setting interventions should aim to
278 help athletes move away from focusing too much on one single performance (time-based)
279 or outcome (finishing place) goal that is too challenging. Instead, developing goal
280 flexibility and focussing on more controllable, process goals during an event can increase
281 athletes’ perceptions of control and, in turn, increase the likelihood of experiencing a
282 challenge state that leads to more positively valenced emotions, increased self-regulatory
283 resources, and enhanced decision-making (e.g., pacing; Jones et al., 2009; Meijen et al.,
284 2020). From an applied perspective with endurance participants, however, it is also
285 important to consider that some people may find it difficult to give up personal goals

286 (Brandstätter et al., 2013), and endurance participants regularly use performance goals to
287 help track their training progress. Thus, another brief-contact goal setting intervention
288 that endurance participants can consider using to prevent a sole focus on outcome and
289 performance goals is to mentally break up a race or long run into pieces, a strategy
290 sometimes called chunking, where participants set a different process goal for each
291 segment (Brick et al., 2016; Brick et al., 2019; McCormick et al., 2019). With regard to
292 conditional knowledge, an endurance participant may focus more on a process goal to
293 regulate their pace during the initial stages of a race to avoid going too fast (see *paceing,*
294 *judgement and decision-making* section), for example. In contrast, in the latter stages they
295 might set a process goal to maintain motivational self-talk (e.g., “Come on! Keep it
296 going!”) to manage effort, discomfort and to optimise pace.

297 **Motivational Self-Talk**

298 Self-talk refers to what people say to themselves either silently in their head or
299 aloud (Hatzigeorgiadis et al., 2014; Latinjak et al., 2019). This self-talk may relate to
300 wanting to stop or slow down, particularly when performing at a high intensity or for
301 longer durations (McCormick & Hatzigeorgiadis, 2019). Researchers have mostly
302 examined three clusters of self-talk research questions in the endurance context; they have
303 described the self-talk that endurance athletes use, explored the factors that shape and
304 determine endurance participants’ self-talk, and examined the effects of strategically
305 using planned self-talk statements on endurance performance (McCormick & Anstiss,
306 2020; McCormick & Hatzigeorgiadis, 2019). The latter cluster of research is particularly
307 relevant to this overview, and it provides considerable evidence that using motivational
308 self-talk strategically can benefit endurance performance. Strategic use of motivational
309 self-talk can be taught using brief-contact interventions without in-person support

310 (McCormick et al., 2018a) and is therefore well suited for brief educational interventions
311 (Brick et al., 2020; McCormick et al., 2020).

312 Strategic self-talk is a strategy where self-talk statements or cue words are
313 deliberately planned and then used (Latinjak et al., 2019). These self-talk statements can
314 be broadly categorised as instructional self-talk and motivational self-talk. Instructional
315 self-talk refers to when people use self-talk to provide instruction relating to technique or
316 form (e.g., “Drop your shoulders”), strategy (e.g., “Time to pick up the pace”), movement
317 qualities (e.g., “Rhythmic pedalling”), or what to pay attention to (e.g., “Watch them
318 going for the overtake”, Hatzigeorgiadis et al., 2014). Motivational self-talk refers to
319 when people use self-talk to psych up (e.g., “Come on – Let’s do this!”), maximise effort
320 (e.g., “The end’s in sight – One last push!”), build confidence (e.g., “You’re doing great
321 – Keep this up”), or achieve a desired feeling state (e.g., “Feeling good so far”).
322 Experimental research supports the efficacy of motivational self-talk for improving
323 endurance performance. Motivational self-talk has been shown to increase cycling time
324 to exhaustion in normal conditions (Blanchfield et al., 2014) and in the heat (Wallace et
325 al., 2017), improve performance times in a 10 km cycling time trial (Barwood et al.,
326 2015), and increase distance cycled in 30 minutes in the heat (Hatzigeorgiadis et al.,
327 2018). A motivational self-talk intervention did not improve performance in a 60-mile
328 ultramarathon, however, although most participants reported finding the intervention
329 helpful and continued to use it six months after their research commitment (McCormick
330 et al., 2018a). When compared against instructional self-talk, recent evidence showed that
331 motivational self-talk relating to effort improved amateur triathletes’ self-paced, 750m
332 swimming times by 2.8%, whereas instructional self-talk related to pace and movement
333 fluency did not influence performance (de Matos et al., 2021). *How* motivational self-talk

334 is said may also influence performance. Recent research (Hardy et al., 2019) showed that
335 when recreational exercisers used motivational self-talk in a third-person pronoun
336 perspective (e.g., “You can do this”, “You’re hanging in well”) during a 10 km cycling
337 time trial, they performed 2.2% faster than when they used similar self-talk in a first-
338 person perspective (e.g., “I can do this”, “I’m hanging in well”).

339 Research findings generally suggest that motivational self-talk is a useful
340 psychological strategy for resisting slowing down or stopping. Particularly relevant to
341 this paper, Schüller and Langens (2007) examined the effects of using self-talk during a
342 psychological crisis in a marathon. They argued that a psychological crisis is
343 characterised by strong desire to give up, and thoughts about the benefits of stopping (e.g.,
344 resting, relaxing) and the costs of continuing (e.g., unbearable exhaustion), and typically
345 occurs after 30 km. Schüller and Langens (2007) found that self-talk relating to self-
346 encouragement (e.g., “Stay on. Don’t give up”), anticipation of positive consequences
347 (e.g., “I will be proud of myself if I can do it”), and self-calming (e.g., “Stay calm and
348 you will do it”) were effective at buffering against the negative effects of a crisis on
349 performance for runners who experienced a big psychological crisis. More recently, this
350 was echoed by DeWolfe et al. (2021) who found that adding a challenge-focused self-talk
351 statement to a negative self-talk statement, such as ‘My legs are tired, but I can push
352 through it’, was beneficial in the last five minutes of a 20-minute constant duration test,
353 compared to the negative self-talk statement only.

354 There is a surprising lack of research examining the effects of instructional self-
355 talk on performance in endurance sports, given that each of the functions of instructional
356 self-talk (i.e., relating to monitoring or controlling technique, form, strategy, movement
357 qualities, and attention) have performance implications (Brick et al., 2014). Brief-contact

358 cues to help participant relax both before and during activity have received some attention
359 in the endurance literature, however.

360 **Relaxation**

361 One of the earliest qualitative studies to investigate the psychological strategies
362 engaged by endurance athletes suggested that elite runners focused on bodily sensations
363 and used this information to adjust their pace and “relax or stay loose” during competitive
364 events (Morgan & Pollock, 1977, p. 390). Subsequent laboratory-based, experimental
365 studies predominantly investigated the impact of both longer-term and brief-contact
366 relaxation interventions on running economy, a measure defined as the rate of oxygen
367 consumed during submaximal running velocities (Caird et al., 1999; Conley &
368 Krahenbuhl, 1980; Hatfield et al., 1992; Moore, 2016; Smith et al., 1995). Given the focus
369 of the present paper, however, we will only consider those studies that included a relevant
370 outcome (e.g., perception of effort or endurance performance).

371 Brick et al. (2018) noted moderate reductions in perception of effort and activation
372 (felt arousal) following brief-contact interventions instructing participants either to smile
373 or to use cues to consciously relax their hands and upper-body whilst running in
374 comparison with instructions to frown. These findings suggest that brief-contact
375 relaxation interventions may be efficacious to alter perceptual responses during
376 endurance tasks. Other studies have incorporated brief-contact relaxation techniques
377 (e.g., PMR, centering, and/or directions to monitor breathing and muscular tension during
378 performance) as part of multi-modal intervention packages that also included goal setting
379 and motivational self-talk during running (Barwood et al., 2008; Patrick & Hrycaiko,
380 1998), swimming (Sheard & Goldby, 2006) and simulated triathlon tasks (Thelwell &
381 Greenlees, 2001, 2003). Although these studies typically demonstrate an improved

382 performance post-intervention, Thelwell and Greenlees (2003) provided an insight into
383 the impact of relaxation strategies on performance. Specifically, post-task interviews
384 revealed that participants employed breathing strategies pre-event to optimise arousal
385 levels. Optimal arousal can, in turn, assist pace-regulation and help athletes avoid going
386 too fast at the beginning of an event (Lane, Devonport, Friesen, et al., 2016). During the
387 triathlon task, participants used breathing strategies to enhance their focus on process
388 goals and race strategy, to reduce tension, and to reduce their focus on perceptions of pain
389 and effort. Despite this, Barwood et al. (2008) noted that participants in their study rated
390 arousal regulation strategies (i.e., PMR, centering) as the least useful and mental imagery
391 and motivational self-talk as the most useful strategies to optimise running performance
392 in hot conditions.

393 Collectively, these findings indicate that relaxation strategies during an event may
394 help endurance participants cope with momentary thoughts to slow down or stop by
395 helping to regulate their pace and reduce a focus on effort-related sensory cues and
396 perceptions of effort (Brick et al., 2016; Thelwell & Greenlees, 2003). Finally, with
397 regard to conditional knowledge (i.e., when to use a specific strategy), other relaxation
398 strategies (e.g., brief PMR, centering) may help to optimise an individual's arousal level
399 pre-event and enhance their focus on race strategy. In doing so, pre-event relaxation
400 strategies can reduce the occurrence of tactical errors such as beginning an event at an
401 excessively fast, unsustainable pace (Stanley et al., 2012; Thelwell & Greenlees, 2003),
402 and the consequent experience of unhelpful thoughts about slowing or stopping.

403 **Distractive Strategies**

404 Active distraction strategies (e.g., focusing on attention-demanding puzzles,
405 conversing) are typically associated with a reduction in effort perception in comparison

406 with a focus on internal bodily sensations (Connolly & Janelle, 2003; Johnson & Siegel,
407 1992; Stanley et al., 2007, for a review see Brick et al., 2014). In addition to lower
408 perceptions of effort, involuntary distraction (e.g., irrelevant daydreams, environmental
409 scenery) is also associated with increased positive affective states during endurance
410 activities, such as greater enjoyment and elevated mood (Aspinall et al., 2015; LaCaille
411 et al., 2004). The extant literature also suggests that distractive strategies (active or
412 involuntary) are particularly helpful for beginner participants, many of whom may not
413 have acquired the procedural knowledge of active self-regulatory strategies to cope with
414 the demands of endurance activity (Brick et al., 2020; Nietfeld, 2003). Furthermore,
415 active distraction is also a useful strategy for endurance participants during longer-
416 distance, lower-intensity activities (e.g., longer training runs or ultra-distance races) when
417 thoughts about stopping may be precipitated by boredom, for example (Brick et al., 2015;
418 Mooneyham & Schooler, 2013). Whether distractive strategies can help endurance
419 participants cope with thoughts about stopping during higher-intensity endurance
420 activities is questionable, however. Specifically, during higher intensity activity or when
421 sensations of bodily discomfort are elevated over a prolonged duration, evidence suggests
422 that distractive cognitions may be less effective than active self-regulatory strategies
423 (Couture et al., 1999; Ekkekakis, 2009; Lind et al., 2009; Tenenbaum et al., 2008). As
424 such, other psychological strategies presented in this overview, such as motivational self-
425 talk, may be more effective than distraction to overcome thoughts about slowing or
426 stopping during higher-intensity endurance activity.

427 **Pacing, Judgement and Decision-Making**

428 The impact of tactical variations in speed on endurance performance has attracted
429 much research interest over the past several decades (de Koning et al., 1999; Hettinga et

430 al., 2019). This idea, colloquially referred to as athletic pacing, has been defined as the
431 control or distribution of power output, work, or energy expenditure, often to complete
432 an event in the fastest possible time, having utilised all available resources (de Koning et
433 al., 1999; Foster et al., 2003). Evidence for pacing as an effective strategy is mostly
434 derived from observations of how successful athletes pace themselves in tasks of varying
435 durations (Abbiss & Laursen, 2008; de Koning et al., 2011). Whereas an all-out pacing
436 strategy works with short tasks of less than a minute (de Koning et al., 2011), a pacing
437 strategy that conserves energy is more effective for endurance tasks (Abbiss & Laursen,
438 2008; St Clair Gibson et al., 2006). As such, if the pace is conservative, then an athlete is
439 less likely to hold perceptions of exertion near to maximum, and, in turn, more likely to
440 avoid experiencing thoughts about stopping in the first place (Brick et al., 2020; Deaner
441 et al., 2015). A negative strategy, involving a slow start and gradually increasing speed,
442 is the most conservative and least risky approach to pacing an endurance event, but
443 probably does not produce the best performance (Thompson et al., 2003). In contrast,
444 using fast-start strategies can deplete metabolic reserves too early (Thompson et al.,
445 2003), are rarely successful (Abbiss & Laursen, 2008; de Koning et al., 2011) and indicate
446 either a lack of experience or poor anticipatory mechanisms (Micklewright et al., 2012).
447 A mixed, parabolic shaped strategy, incorporating a moderate starting speed, slower mid-
448 section and fast finish, often results in faster completion of endurance events (Abbiss &
449 Laursen, 2008) but requires individuals to make risk-based judgements about tolerable
450 starting speed without compromising overall performance (Micklewright et al., 2015).

451 Physiological factors known to influence pace include core temperature, muscle
452 acidosis, oxygen uptake, and carbohydrate availability (Tucker & Noakes, 2009).
453 Environmental influences on pace include, but are not limited to, ambient temperature

454 (Tatterson et al., 2000), wind speed (Atkinson & Brunskill, 2000), and terrain
455 (Micklewright et al., 2009). Most pertinent to this overview is the importance of various
456 psychological and social factors that have been associated with pacing behaviours, such
457 as perception of effort (Hampson et al., 2001; Marcora, 2009; Venhorst et al., 2018),
458 previous experience (Micklewright et al., 2010), decision-making (Micklewright et al.,
459 2017; Renfree et al., 2014), visual perception (Parry et al., 2013), information uptake and
460 utilisation (Boya et al., 2017), emotion (Baron et al., 2011; Lane & Wilson, 2011), risk-
461 taking personality traits (Micklewright et al., 2015), and competitor behaviour (Corbett
462 et al., 2012). Such factors provide some evidential basis for brief-contact educational
463 interventions that could help endurance participants of varying abilities develop effective
464 pacing strategies according to the goals they have set themselves to help manage thoughts
465 of slowing down or stopping.

466 Based on optimal pacing strategies and factors known to influence pacing in
467 endurance activities, several recommendations for brief-contact interventions can be
468 made to minimise behavioural urges to slow or stop. The focus of these pacing strategies
469 can be split into activities before, during, and immediately after an event, which aligns
470 with the self-regulation phases of planning (i.e., forethought), executing a plan (i.e.,
471 action), and reflecting on the effectiveness of the plan (Zimmerman, 2000). These skills
472 have been highlighted as particularly important to develop pacing abilities in endurance
473 contexts (Brick et al., 2016; Elferink-Gemser & Hettings, 2017).

474 Before an event, it might be advantageous to develop knowledge about the course,
475 weather conditions, and, if relevant, likely competitors. A good understanding of the
476 course profile will help develop a pacing strategy appropriate to the demands of the event
477 (Brick et al., 2019) and inform (process) goals for the event. Similarly, the challenges of

478 pacing against other competitors (Corbett et al., 2012) might be diminished with
479 background research about their relative strengths, weaknesses, and past race strategies.
480 During the event, subject to thorough pre-race preparation, individuals should be able to
481 approximate a pacing strategy that best suits their objectives. Monitoring, evaluating, and
482 adapting pacing is important to prevent errors that increase the risk of significantly
483 slowing down or stopping later on in the event (Brick et al., 2016; Elferink-Gemser &
484 Hettings, 2017). As such, tactical errors can be prevented through accurate pace
485 monitoring of speed, time, and distance using GPS devices or learning particular
486 landmark cues associated with a course. Furthermore, periodic monitoring of internal
487 sensory cues (e.g., breathing rate) to inform pace-related decision-making may be a useful
488 strategy to avoid pacing mistakes and subsequent thoughts about slowing or stopping
489 (Brick et al., 2015; Brick et al., 2020). As soon after the event as possible, individuals
490 may wish to mentally re-enact the race perhaps using the course profile or their GPS
491 output data as a prompt. This is an important way to evaluate pacing, reflect, and update
492 planning for future endurance events (Brick et al., 2016; Elferink-Gemser & Hettings,
493 2017). Mental re-enactment could include recalling which sections went well and which
494 did not go so well, remembering feelings that were experienced at the time, and what
495 pacing responses, psychological techniques (e.g., self-talk, relaxation) or behavioural
496 actions were used to cope with unhelpful and unwanted thoughts during performance
497 (Baker et al., 2005). To complete the self-regulation cycle, these reflections can inform
498 planning (i.e., forethought) ahead of future endurance activities. More so, an approach to
499 help individuals effectively engage in self-regulation, especially in the action phase and
500 during critical performance moments is the formation of implementation intentions
501 during the forethought phase (Sheeran & Webb, 2016). Implementation intentions, as

502 applied to overcome thoughts about slowing down or stopping, are considered in the
503 following section.

504 **Implementation Intentions**

505 In this section, we propose a novel use for implementation intentions (i.e., if-then
506 planning) to develop endurance participants' conditional knowledge of when to use
507 specific strategies. Individuals often set goals and engage in strategic planning in the
508 forethought phase of self-regulation. These intentions are, however, not always acted on;
509 that is, they do not automatically convert to behaviour (Heckhausen & Gollwitzer, 1987;
510 Webb et al., 2012). To help reduce the gap between goal intentions (e.g., "I want to keep
511 going at a steady pace") and subsequent actions, individuals can employ implementation
512 intentions, or if-then planning (Gollwitzer, 1999). Specifically, an individual
513 experiencing thoughts of slowing or stopping can reflect on and appraise their situation
514 to identify which psychological strategies are likely to be most effective in regulating
515 their response and maintaining goal pursuit to keep going (the 'then'). As such,
516 implementation intentions support the realisation of goal intentions by specifying when,
517 where, and how goal-directed responses should be initiated. Implementation intentions
518 typically take the form of an explicit plan expressed as, "*If situation X arises, then I will*
519 *do Y*" (Gollwitzer, 1999; Lane, Devonport, Stanley, et al., 2016; Lane, Totterdell, et al.,
520 2016). If-then plans represent a simple, evidence-based technique to help people act on
521 goal intentions and initiate facilitative actions at the critical juncture to realise goal
522 achievement. The effectiveness of if-then planning lies in the applicability and
523 accessibility of strategic responses during critical performance moments (Gollwitzer,
524 1999; Lane, Totterdell, et al., 2016).

525 Although widely researched in health behaviour settings, implementation
526 intentions have not, to date, been extensively applied in the whole-body endurance
527 performance literature (Hirsch et al., 2020; Lane, Devonport, Stanley, et al., 2016; Lane,
528 Totterdell, et al., 2016). We propose that implementation intentions might provide a
529 novel, action-oriented method to enhance the effectiveness of brief-contact psychological
530 strategy interventions in endurance performance contexts. In support, implementation
531 intentions have, for example, been shown to enhance goal attainment and self-regulation
532 of disruptive thoughts and physiological states in other sporting settings such as tennis
533 (Achtziger et al., 2008). Applied to endurance performance contexts, implementation
534 intentions may, for example, be used to adhere to a pre-planned pacing strategy (then) to
535 avoid going too fast at the start of a marathon (if), a common error made by less
536 experienced participants (Deaner et al., 2015). Similarly, a cyclist might plan to use a
537 motivational self-statement (then) if their perception of effort is elevated and their self-
538 talk becomes negative and defeatist (i.e., a psychological crisis; Schüler & Langens,
539 2007). Recognising situations that can trigger an unhelpful behavioural or emotional
540 response may help endurance athletes self-regulate more effectively using antecedent-
541 focused strategies (McCormick et al., 2018b). Using implementation intentions in this
542 way aligns with the different phases of self-regulation (i.e., forethought, action, and
543 reflection). Specifically, becoming aware of critical situations where thoughts of slowing
544 down or stopping occur (i.e., action and reflection) can help to plan for future situations
545 (i.e., forethought).

546 Despite these positive assertions, the use of implementation intentions does come
547 with some important caveats that practitioners and coaches should consider. Foremost
548 amongst these is a careful contemplation of the planned-for scenarios. Specifically,

549 practicing implementation-intentions for situations that are unrealistic or unlikely to occur
550 (i.e., the *if* part) will not be of benefit to the athlete (Brandstätter et al., 2001; Gollwitzer
551 & Oettingen, 2011). Similarly, one should also be cautious about focusing too much on
552 expecting a critical situation to happen (Hirsch et al., 2020). This can potentially place
553 excessive focus on the critical situation and not on more relevant, task-specific processes.
554 In addition, the response to a situation (i.e., the *then* part) needs to be appropriate and
555 should also be carefully considered when planning pre-event (Brandstätter et al., 2001;
556 Gollwitzer & Oettingen, 2011). Specifically, when employing implementation intentions
557 as the basis of a brief-contact intervention, it is essential to encourage the athlete to
558 practice and reflect on the use of a formulated response to update future if-then plans.
559 Furthermore, when considering using psychological strategies as an intervention, it is
560 important to explore the athlete's expectations of success and their goal intention. To
561 illustrate, when an individual expects to be successful, they may have a strong
562 commitment to a strategy or an if-then plan. In contrast, when the expectations of success
563 are low an individual may not commit to a formulated if-then plan (Oettingen &
564 Gollwitzer, 2010).

565 **Critique of the Evidence Base**

566 As highlighted throughout this expert opinion paper, the available research
567 evidence demonstrates that a range of psychological strategies can be used to overcome
568 slowing down or stopping. To further support this contention, we have included a table
569 in Appendix 1 to provide a descriptive overview of each of the intervention studies
570 comprising the evidence-base for the strategies presented in this paper. Whereas the
571 Working Group selected five psychological strategies that are grounded in research
572 evidence, as Appendix 1 highlights, the five strategies vary in the amount of experimental

573 research that supports their efficacy as brief interventions for improving endurance
574 performance. Notably, pacing, judgement, and decision-making is a highly researched
575 topic in endurance contexts, but there is a lack of intervention studies aiming to improve
576 pacing to benefit outcomes such as performance and quality of experience. Brief-contact
577 educational interventions to improve pacing, judgement, and decision-making (e.g.,
578 advice on pacing strategies for participants completing their first mass-participation
579 event) could be valuable. Although the experimental evidence for each strategy varies,
580 there are consistent limitations across the research area that could be considered when
581 interpreting the research evidence.

582 Specifically, researchers aim to determine if interventions are efficacious, and
583 often approach this using randomised, controlled experiments in laboratory
584 environments. Such efficacy studies occur in different conditions to where athletes
585 perform, however, and, as such, the generalisability of this work to applied settings is
586 unclear from the perspectives of athletes and practitioners. These issues are not unique to
587 sport psychology research and practice and are also prevalent concerns in the broader
588 sport and exercise science domain (Beedie et al., 2015). Few studies have been conducted
589 at actual endurance events with endurance athletes as participants (for exceptions, see
590 Jaenes et al., 2021; McCormick et al., 2018a; Schüller & Langens, 2007). This is an
591 important limitation given that the stressors experienced at real-life events, and how these
592 stressors are appraised, may differ from those typically experienced in laboratory-based
593 research (McCormick et al., 2020). Consequently, event stressors and other antecedents
594 of thoughts about slowing down or stopping may not be fully explicated in the extant
595 literature (Meijen et al., 2018).

596 In addition, few studies have delivered ecologically valid psychological
597 interventions in endurance settings. This applies to brief-contact interventions, as well as
598 to more personalised and longer-term, ongoing psychological interventions. In relation to
599 this overview, although studies have examined the effects of brief-contact instructions
600 and workbooks, there is a lack of studies examining the effects of interventions delivered
601 as webpages, online videos, workshops, magazine articles, podcasts, or similar (as an
602 exception, see Meijen et al., 2021). We encourage more research that examines the effects
603 of interventions that are delivered in ways that reflect applied sport psychology, for real-
604 life endurance participants. Similarly, we also advocate for studies that consider the
605 broader environment of the endurance athlete, whereby sport psychology practitioners
606 educate coaches, sport scientists, sport therapists, and other professionals on evidence-
607 based, brief-contact intervention strategies that these individuals may, in turn, use with
608 endurance athletes.

609 Although these points could be addressed using efficacy studies, effectiveness
610 studies are also encouraged (Bishop, 2008) to help determine the effects of interventions
611 when delivered to the target population, within a real-life sport context, and when
612 measuring real-life endurance variables (e.g., performance time at an event or percentage
613 of an event walked). The interventions could be delivered in ways that are preferable to
614 endurance participants or that draw on facilitators to intervention use (e.g., interventions
615 delivered through popular endurance websites; McCormick et al., 2020), and they would
616 need to overcome constraints of the real-life sporting world (e.g., time constraints, coach
617 knowledge constraints; Bishop, 2008). In contrast to the short-term effects typically
618 documented in research, studies could also consider the long-term impact of
619 interventions, such as the effects on performance over the course of months or a

620 competitive season. Attempts to conduct longer-term, ecologically valid research that has
621 sufficient control remains an extremely challenging task for the academic community, yet
622 is not unprecedented in the wider sport psychology literature (e.g., Senécal et al., 2008).
623 The size of the challenge should not be under-estimated.

624 Furthermore, as discussed elsewhere (McCormick et al., 2015; McCormick et al.,
625 2019), relatively few intervention studies in the endurance context are theoretically
626 informed. Few have designed interventions, such as brief-contact educational
627 interventions, to target the underpinning intervention-performance mechanisms. Some
628 interventions have been informed by the psychobiological model of endurance
629 performance, and have aimed to reduce perception of effort (Blanchfield et al., 2014).
630 Nevertheless, other psychological constructs such as self-efficacy (Anstiss et al., 2018),
631 self-control and motivation (Taylor et al., 2018), pain (Mauger, 2019), and emotion
632 (McCormick et al., 2015) are relevant to endurance performance. Theoretically informed
633 interventions could target mechanisms underpinning endurance performance, and
634 therefore lead to greater or more consistent intervention effects (McCormick et al., 2015;
635 McCormick et al., 2019). A range of theoretical approaches and frameworks have been
636 suggested to better inform intervention studies in the endurance context (e.g., Brick et al.,
637 2015; McCormick et al., 2019; Micklewright et al., 2017; Renfree et al., 2014; Taylor et
638 al., 2018).

639 Finally, only a select number of intervention studies included in this overview
640 have taken an interdisciplinary approach (e.g., Barwood et al., 2008; Blanchfield et al.,
641 2014; Smith et al., 1995). For example, Barwood and colleagues (2008) tested the effect
642 of a psychological skills training intervention consisting of goal setting, relaxation,
643 mental imagery, and positive/motivational self-talk on a 90-minute running task in hot

644 (30°C) conditions. Outcome measures included physiological (e.g., body temperature,
645 sweat production, hormone production) and psychophysiological variables (e.g., ratings
646 of perceived effort, thermal comfort). The findings revealed that participants who
647 received the psychological skills training maintained a faster pace and ran significantly
648 further (8%) post-intervention in comparison with pre-intervention, though physiological
649 measures did not indicate a mechanism underpinning this improvement. Despite the
650 potential challenges of designing interdisciplinary research, we suggest that researchers
651 work using an interdisciplinary approach (e.g., by including physiologists, biomechanists,
652 and psychologists in a research team) as the psychological, biomechanical, and
653 physiological elements of endurance performance interact. This proposition is reinforced
654 by Moore and colleagues (Moore et al., 2019), who recently demonstrated how verbal
655 cues focused either internally (i.e., “run with a flat foot”), externally (i.e., “run quietly”),
656 or combined based on clinical practice (i.e., “we are aiming to change foot strike, so run
657 quietly”) impacted differentially on running kinematics, physiological (e.g., volume of
658 oxygen consumed) and psychophysiological (e.g., rating of perceived effort) responses
659 during six-minute running trials. As such, adopting an interdisciplinary approach will
660 help ensure that the impact of brief educational psychological interventions during
661 endurance activity are fully explored, that best-practice advice considers all aspects of
662 performance, and that risks associated with attempting to overcome thoughts about
663 slowing down or stopping are taken into account. These risks are discussed next.

664 **Risks Associated with Attempting to Overcome Thoughts about Slowing Down or** 665 **Stopping**

666 The psychological strategies described in this expert opinion paper may appear to
667 have no side effects. However, it is not always advisable to attempt to overcome thoughts

668 of slowing or stopping, particularly in conditions (e.g. heat exhaustion) that can lead to
669 life-threatening events (e.g., heat stroke) and when continued endurance exercise can
670 aggravate a musculoskeletal injury. In most circumstances, using psychological strategies
671 to overcome thoughts about slowing down or stopping is safe as demonstrated by
672 numerous controlled, experimental studies on the effects of psychological interventions
673 on endurance performance in healthy adults (McCormick et al., 2015). There are,
674 however, real-life situations in which overcoming these behavioural impulses may harm
675 the endurance participant or even lead to their death. In line with the earlier discussion on
676 conditional knowledge, here we provide a brief overview of such situations to help the
677 endurance participant recognise them, and provide references for further reading. When
678 in doubt, help should always be sought from the race medical personnel.

679 The first condition that can be aggravated by continued endurance exercise is
680 musculoskeletal injury. The sharp and usually localised pain associated with it should not
681 be ignored. On the contrary, it is safe to continue exercising when experiencing the
682 naturally occurring muscle pain caused by lactic acid and other by-products of high-
683 intensity endurance exercise (e.g., whilst cycling a steep hill; Cook et al., 1997; Pollak et
684 al., 2014). Another kind of pain common in endurance exercise with eccentric muscle
685 contractions and/or multiple days of competitions (e.g., ultra-trails) is acute or delayed-
686 onset muscle soreness. Although muscle soreness is normally associated with damage of
687 the muscle fibres, it is still possible to perform endurance exercise safely (Marcora &
688 Bosio, 2007). However, if the endurance participant experiences very severe muscle
689 soreness and/or the urine is of a dark red or brown colour, they should stop and
690 immediately seek medical attention because these are signs and symptoms of acute

691 exertional rhabdomyolysis. If left untreated, this condition can lead to kidney failure and,
692 in some cases, death (Brudvig & Fitzgerald, 2007).

693 Another situation that it is not advisable to resist stopping during is when
694 experiencing symptoms of myocardial ischaemia or other acute cardiovascular events that
695 can occur during endurance competitions (Gerardin et al., 2016). Whereas a high heart
696 rate and heavy breathing are normal responses to intense exercise, angina, irregular
697 heartbeats, and severe shortness of breath are not (Hamilton et al., 1995). Although a rare
698 occurrence in running, these symptoms can be associated with more severe events such
699 as sudden cardiac death (e.g., Day & Thompson, 2010). Instead of overcoming these
700 symptoms of an acute cardiovascular event, endurance participants should stop and
701 request immediate medical assistance to prevent further complications and risk (Gerardin
702 et al., 2016).

703 The last condition that endurance participants should learn to prevent is heat
704 stroke. This condition, defined as a core temperature of $>40^{\circ}\text{C}$ with central nervous
705 system disturbances (e.g., ataxia and confusion), is associated with significant morbidity
706 and mortality and occurs relatively often in individuals competing in hot and humid
707 environments (Howe & Boden, 2007). Although the use of psychological strategies like
708 motivational self-talk during endurance exercise in the heat have seemed safe in
709 controlled experimental studies (Hatzigeorgiadis et al., 2018; Wallace et al., 2017), there
710 is no doubt that prolonging endurance exercise in people at risk of developing heat stroke
711 may be dangerous (Westwood et al., 2021). The challenge for the endurance performer is
712 to recognise the symptoms of heat exhaustion and stop exercising before it progresses to
713 heat stroke, or plan for challenging environmental conditions to prevent heat exhaustion

714 from occurring. The symptoms of heat exhaustion are dizziness, malaise,
715 nausea/vomiting, headache, and extreme fatigue (Howe & Boden, 2007).

716 **Conclusion**

717 Research supports the use of a range of psychological strategies to resist slowing
718 down or stopping during endurance activity. We have provided an expert opinion on how
719 brief-contact, educational interventions that draw on research on goal setting,
720 motivational self-talk, relaxation, distraction, and pacing can be used to resist these
721 behavioural urges. We have also proposed that implementation intentions (i.e., if-then
722 plans) offer a structure for using these strategies that fit the endurance context and that
723 can develop individuals' conditional knowledge of when to use specific strategies. We
724 suggest that the content of brief-contact educational interventions could be shared with
725 large populations of endurance athletes, particularly recreational participants, face-to-face
726 by accredited and trainee sport and exercise psychologists and by appropriately trained
727 coaches, sport scientists, and sport therapists. Intervention content can also be shared via
728 alternative media including websites, online videos, workshops, or in magazine articles.
729 Finally, to promote further research in this domain, ecologically-valid efficacy and
730 effectiveness studies are encouraged that examine the effects of psychological strategies
731 on both acute and longer-term outcomes.

732 **Compliance with Ethical Standards**

733 The manuscript does not contain clinical studies or patient data. This work was supported
734 by a British Psychological Society Division of Sport and Exercise Psychology Research
735 Working Group grant award. SM received consulting fees from Edelman/ASICS to work

736 on an event (Eternal Run) in which the ability to resist the urge to stop or slow down
737 played an essential role.

738 **References**

739 Abbiss, C. R., & Laursen, P. B. (2008). Describing and understanding pacing strategies
740 during athletic competition. *Sports Medicine*, 38(3), 239-252.

741 Achtziger, A., Gollwitzer, P. M., & Sheeran, P. (2008). Implementation intentions and
742 shielding goal striving from unwanted thoughts and feelings. *Personality and*
743 *Social Psychology Bulletin* 34, 381–393.

744 Allen, D. G., & Lamb, G. D., (2008). Westerblad H. Skeletal muscle fatigue: cellular
745 mechanisms. *Physiology Review*, 88(1), 287-332.

746 Anstiss, P. A., Meijen, C., & Marcora, S. M. (2018). The sources of self-efficacy in
747 experienced and competitive endurance athletes. *International Journal of Sport*
748 *and Exercise Psychology*. [Advance online publication].

749 Aspinall, P., Mavros, P., Coyne, R., & Roe, J. (2015). The urban brain: Analysing
750 outdoor physical activity with mobile EEG. *British Journal of Sports Medicine*,
751 49, 272-276.

752 Atkinson, G., & Brunskill, A. (2000). Pacing strategies during a cycling time trial with
753 simulated headwinds and tailwinds. *Ergonomics*, 43(10), 1449-1460.

754 Bailey, R. P., Madigan, D. J., Cope, E., & Nicholls, A. R. (2018). The prevalence of
755 pseudoscientific ideas and neuromyths among sports coaches. *Frontiers in*
756 *Psychology*, 9:641.

- 757 Baker, J., Côté, J., & Deakin, J. (2005). Cognitive characteristics of expert middle of the
758 pack and back of the pack ultra-endurance triathletes. *Psychology of Sport and*
759 *Exercise, 6*(5), 551-558.
- 760 Baron, B., Moullan, F., Deruelle, F., & Noakes, T. D. (2011). The role of emotions on
761 pacing strategies and performance in middle and long duration sport events.
762 *British Journal of Sports Medicine, 45*(6), 511-517.
- 763 Barwood, M. J., Corbett, J., Wagstaff, C. R. D., McVeigh, D., & Thelwell, R. C. (2015).
764 Improvement of 10-km time-trial cycling with motivational self-talk compared
765 with neutral self-talk. *International Journal of Sports Physiology Performance,*
766 *10*, 166-171.
- 767 Barwood, M., Thelwell, R., & Tipton, M. (2008). Psychological skills training improves
768 exercise performance in the heat. *Medicine and Science in Sports and Exercise,*
769 *40*(2), 398-406.
- 770 Beedie, C. J., Lane, A. M., & Wilson, M. G. (2012). A possible role for emotion and
771 emotion regulation in physiological responses to false performance feedback in
772 10 mile laboratory cycling. *Applied Psychophysiology Biofeedback, 37*(4), 269-
773 277.
- 774 Beedie, C., Mann, S., Jiminez, A., Kennedy, L., Lane, A. M., Domone, S., Wilson, S.,
775 & Whyte, G. (2015). Death by effectiveness: exercise as medicine caught in the
776 efficacy trap! *British Journal of Sports Medicine, 50*, 323-324.
- 777 Bishop, D. (2008). An applied research model for the sport sciences. *Sports Medicine,*
778 *38*(3), 253-263.

- 779 Blanchfield, A. W., Hardy, J., de Morree, H. M., Staiano, W., & Marcora, S. M. (2014).
780 Talking yourself out of exhaustion: the effects of self-talk on endurance
781 performance. *Medicine and Science in Sports and Exercise*, *46*, 998–1007.
- 782 Boya, M., Foulsham, T., Hettinga, F., Parry, D., Williams, E., Jones, H., Sparks, A.,
783 Marchant, D., Ellison, P., Bridge, C., McNaughton, L., & Micklewright, D.
784 (2017). Information acquisition differences of experienced and novice time trial
785 cyclists. *Medicine and Science in Sport and Exercise*, *49*(9), 1884-1898.
- 786 Brandstätter, V., Herrmann, M., & Schüler, J. (2013). The struggle of giving up
787 personal goals. *Personality and Social Psychology Bulletin*, *39*(12), 1668-1682.
- 788 Brandstätter, V., Lengfelder, A., & Gollwitzer P. M. (2001). Implementation intentions
789 and efficient action initiation. *Journal Personality Social Psychology*, *81*(5),
790 946-960.
- 791 Brick, N. E., Campbell, M. J., Sheehan, R. B., Fitzpatrick, B. L., & MacIntyre, T. E.
792 (2020). Metacognitive processes and attentional focus in recreational endurance
793 runners. *International Journal of Sport and Exercise Psychology*, *18*(3), 362-379.
- 794 Brick, N. E., Fitzpatrick, B. L., Turkington, R., & Mallett, J. C. (2019). Anticipated task
795 difficulty provokes pace conservation and slower running performance. *Medicine
796 and Science in Sport and Exercise*, *51*(4), 734-743.
- 797 Brick, N. E., MacIntyre, T. E., & Campbell, M. J. (2016). Thinking and action: a
798 cognitive perspective on self-regulation during endurance performance.
799 *Frontiers in Physiology*, *7*:159
- 800 Brick, N. E., McElhinney, M. J., & Metcalfe, R. S. (2018). The effects of facial
801 expression and relaxation cues on movement economy, physiological, and

- 802 perceptual responses during running. *Psychology of Sport and Exercise*, 34, 20-
803 28.
- 804 Brick, N., MacIntyre, T., & Campbell, M. (2014). Attentional focus in endurance
805 activity: New paradigms and future directions. *International Review of Sport and*
806 *Exercise Psychology*, 7, 106–34.
- 807 Brick, N., MacIntyre, T., & Campbell, M. (2015). Metacognitive processes in the self-
808 regulation of performance in elite endurance runners. *Psychology of Sport and*
809 *Exercise*, 19, 1-9.
- 810 British Psychological Society. (2018). *Qualification in Sport and Exercise Psychology*
811 *(Stage 2) Candidate Handbook*. [https://www.bps.org.uk/qualifications/sport-](https://www.bps.org.uk/qualifications/sport-exercise-psychology/candidates)
812 [exercise-psychology/candidates](https://www.bps.org.uk/qualifications/sport-exercise-psychology/candidates)
- 813 British Psychological Society. (2021). *Division of Sport and Exercise Psychology:*
814 *Awards & Funding / BPS*. [online] Available at:
815 <[https://www.bps.org.uk/member-microsites/division-sport-exercise-](https://www.bps.org.uk/member-microsites/division-sport-exercise-psychology/awards-funding)
816 [psychology/awards-funding](https://www.bps.org.uk/member-microsites/division-sport-exercise-psychology/awards-funding)> [Accessed 14 June 2021].
- 817 Brudvig, T. J., & Fitzgerald, P. I. (2007). Identification of signs and symptoms of acute
818 exertional rhabdomyolysis in athletes: A guide for the practitioner. *Strength and*
819 *Conditioning Journal*, 29(1), 10-14.
- 820 Buman, M. P., Omli, J. W., Giacobbi Jr., P. R., & Brewer, B. W. (2008). Experiences
821 and coping responses of “hitting the wall” for recreational marathon runners.
822 *Journal of Applied Sport Psychology*, 20, 282-300.
- 823 Buman, M. P., Brewer, B. W., Cornelius, A. E., Van Raalte, J. L., & Petitpas, A. J.
824 (2008). Hitting the wall in the marathon: Phenomenological characteristics and

- 825 associations with expectancy gender and running history. *Psychology of Sport*
826 *and Exercise, 9*(2),
- 827 Burdina, M., Hiller, R. S., & Metz, N. E. (2017). Goal attainability and performance:
828 Evidence from Boston marathon qualifying standards. *Journal of Economic*
829 *Psychology, 58*, 77-88.
- 830 Burton, D., & Naylor, S. (2002). The Jekyll/Hyde nature of goals: revisiting and
831 updating goal setting in sport. In T. Horn (Ed). *Advances in sport psychology*.
832 Champaign IL: Human Kinetics. pp. 267-97.
- 833 Caird, S. J., McKenzie, A. D., & Sleivert, G. G. (1999). Biofeedback and relaxation
834 techniques improve running economy in sub-elite long distance runners.
835 *Medicine and Science in Sports and Exercise, 31*, 717-722.
- 836 Cannon, D. T., Coelho, A. C., Cao, R., Cheng, A., Porszasz, J., Casaburi, R., &
837 Rossiter, H. B. (2016). Skeletal muscle power and fatigue at the tolerable limit of
838 ramp-incremental exercise in COPD. *Journal of Applied Physiology, 121*(6),
839 1365–1373.
- 840 Cleary, T. J., Zimmerman, B. J., & Keating, T. (2006). Training physical education
841 students to self-regulate during basketball free throw practice. *Research*
842 *Quarterly in Exercise and Sport, 77*, 251–262.
- 843 Conley, D. L., & Krahenbuhl, G. S. (1980). Running economy and distance running
844 performance of highly trained athletes. *Medicine and Science in Sports and*
845 *Exercise, 12*(5), 357-360.

- 846 Connolly, C. T., & Janelle, C. M. (2003). Attentional strategies in rowing: performance,
847 perceived exertion, and gender considerations. *Journal of Applied Sport*
848 *Psychology, 15*, 195-212.
- 849 Cook, D. B., O'Connor, P. J., Eubanks, S. A., Smith, J. C., & Lee, M. (1997). Naturally
850 occurring muscle pain during exercise: assessment and experimental evidence.
851 *Medicine and Science in Sports and Exercise, 29*(8), 999-1012.
- 852 Cooper, K. B., Wilson, M. R., & Jones, M. I. (2020). Fast talkers? Investigating the
853 influence of self-talk on mental toughness and finish times in 800-meter runners.
854 *Journal of Applied Sport Psychology*, advance online publication.
- 855 Coquart, J. B., Eston, R. G., Noakes, T. D., Tourny-Chollet, C., L'hermette, M.,
856 Lemaitre, F., & Garcin, M. (2012). Estimated time limit: a brief review of a
857 perceptually based scale. *Sports Medicine, 42*(10), 845-855.
- 858 Corbett, J., Barwood, M. J, Ouzounoglou, A., Thelwell, R., & Dicks, M. (2012).
859 Influence of competition on performance and pacing during cycling exercise.
860 *Medicine and Science in Sport and Exercise, 44*(3), 509-515.
- 861 Cotterill, S., & Symes, R. (2014). Integrating social media and new technologies into
862 your practice as a sport psychology consultant. *Sport and Exercise Psychology*
863 *Review, 10*(1), 55-64.
- 864 Couture, R. T., Jerome, W., & Tihanyi, J. (1999). Canadian associative and dissociative
865 strategies affect the swimming performance of recreational swimmers? *The Sport*
866 *Psychologist, 13*, 334-343.
- 867 Day, C. (2019) Application to recreational settings: working with the public, psyching
868 team activities and suggestions. In C. Meijen (Ed). *Endurance performance in*

- 869 *sport: psychological theory and interventions*. Oxon UK: Routledge. pp. 201-
870 211.
- 871 Day, S. M., & Thompson, P. D. (2010). Cardiac risks associated with marathon
872 running. *Sports Health*, 2(4), 301–306.
- 873 de Koning, J. J., Bobbert, M. F., & Foster, C. (1999). Determination of optimal pacing
874 strategy in track cycling with an energy flow model. *Journal of Science and*
875 *Medicine in Sport*, 2(3), 266-277.
- 876 de Koning, J. J., Foster, C., Bakkum, A., Kloppenburg, S., Thiel, C., Joseph, T., Cohen,
877 J., & Porcari, J. P. (2011). Regulation of pacing strategy during athletic
878 competition. *PLOS one*, 6(1), e15863.
- 879 de Matos, L. F., Bertollo, M., Stefanello, J. M. F., Pires, F. O., da Silva, C. K.,
880 Nakamura, F. Y., & Pereira, G. (2021). Motivational self-talk improves time-trial
881 swimming endurance performance in amateur European triathletes. *International*
882 *Journal of Sport and Exercise Psychology*, 19(3), 446-459.
- 883 de Shazer, S., Dolan, Y., Korman, H., McCollum, E., Trepper, T., & Berg, I. K.
884 (2007). *More than miracles: The state of the art of solution-focused brief*
885 *therapy*. Haworth Press.
- 886 Deaner, R. O., Carter, R. E., Joyner, M. J., & Hunter, S. K. (2015). Men are more likely
887 than women to slow in the marathon. *Medicine and Science in Sports and*
888 *Exercise*, 47, 607–616.
- 889 DeWolfe, C. E. J., Scott, D., & Seaman, K. A. (2021). Embrace the challenge:
890 Acknowledging a challenge following negative Self-Talk improves performance.
891 *Journal of Applied Sport Psychology*, 33(5), 527-540.

- 892 Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual
893 lens on metacognition, self-regulation, and self-regulated learning. *Educational*
894 *Psychology Review*, 20, 391-409.
- 895 Ekblom, B., & Goldberg, A. N. (1971). The influence of physical training and other
896 factors on the subjective rating of perceived exertion. *Acta Physiology*
897 *Scandinavica*, 83(3), 399-406.
- 898 Ekkekakis, P. (2009). The Dual-Mode Theory of affective responses to exerciser in
899 metatheoretical context: II. Bodiless heads, ethereal cognitive schemata, and
900 other improbable dualistic creatures, exercising. *International Review of Sport*
901 *and Exercise Psychology*, 2, 139-160.
- 902 Elferink-Gemser, M. T., & Hettinga, F. J. (2017). Pacing and self-regulation: Important
903 skills for talent development in endurance sports. *International Journal of Sports*
904 *Physiology Performance*, 12(6), 831-835.
- 905 Forgas, J. P., Baumeister, R. F., & Tice, D. M. (2009). Psychology of self-regulation: an
906 introductory review. In J. P. Forgas, R. F. Baumeister, & D. M. Tice (Eds).
907 *Psychology of self-regulation: cognitive affective and motivational processes*.
908 Psychology Press. pp. 1-17.
- 909 Foster, C., De Koning, J. J., Hettinga, F., Lampen, J., La Clair, K. L., Dodge, C.,
910 Bobbert, M., & Porcari, J. P. (2003). Pattern of energy expenditure during
911 simulated competition. *Medicine and Science in Sports and Exercise*, 35, 826-
912 831.

- 913 Freudenheim, A. M., Wulf, G., Madureira, F., Pasetto, S. C., & Corrêa, U. C. (2010).
914 An external focus of attention results in greater swimming speed. *International*
915 *Journal of Sports Science Coaching*, 5(4), 533-542.
- 916 Gaudreau, P., Blondin, J. P., & Lapierre, A. M. (2002). Athletes' coping during a
917 competition: relationship of coping strategies with positive affect negative affect
918 and performance-goal discrepancy. *Psychology of Sport and Exercise*, 3, 125-
919 150.
- 920 Gerardin, B., Collet, J.-P., Mustafic, H., Bellemain-Appaix, A., Benamer, H., Monsegu,
921 J., Teiger, E., Livarek, B., Jaffry, M., Lamhaut, L., Fleischel, C., Aubry, P., &
922 Groupe de Réflexion sur la Cardiologie Interventionnelle. (2016). Registry on
923 acute cardiovascular events during endurance running races: the prospective
924 RACE Paris registry. *European Heart Journal*, 37(32), 2531–2541.
- 925 Gibbs-Nicholls, S., McCormick, A., & Coyle, M. (2022). “Keep the pace! You’ve got
926 this!”: The content and meaning of impactful crowd encouragement at mass
927 running events. *The Sport Psychologist*, 36, 115-127.
- 928 Giges, B., & Petitpas, A. (2000). Brief contact interventions in sport psychology. *The*
929 *Sport Psychologist*, 14(2), 176-187.
- 930 Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans.
931 *American Psychologist*, 54, 493-503.
- 932 Gollwitzer, P. M., & Oettingen, G. (2011). Planning promotes goal-striving. In K. D.
933 Vohs, & R. F. Baumeister (Eds). *Handbook of self-regulation: research theory*
934 *and applications*. New York NY: The Guilford Press. pp. 162-185.

- 935 Gould, D. (2010). Goal setting for peak performance. In J. M. Williams (Ed). *Applied*
936 *sport psychology: personal growth to peak performance*. New York: McGraw-
937 Hill. pp. 201-20.
- 938 Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review
939 types and associated methodologies. *Health Information and Libraries*
940 *Journal, 26(2)*, 91-108.
- 941 Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: conceptual foundations. In
942 J. J. Gross (Ed). *Handbook of emotion regulation*. New York: Guilford. pp. 3-
943 26.
- 944 Hamilton, A. L., Killian, K. J., Summers, E., & Jones, N. L. (1995). Muscle strength
945 symptom intensity and exercise capacity in patients with cardiorespiratory
946 disorders. *American Journal of Respiratory and Critical Care Medicine, 152(6*
947 *Pt 1)*, 2021-2031.
- 948 Hampson, D. B., St Clair Gibson, A., Lambert, M. I., & Noakes, T. D. (2001). The
949 influence of sensory cues on the perception of exertion during exercise and
950 central regulation of exercise performance. *Sports Medicine, 31(13)*, 935-952.
- 951 Hanton, S, & Jones, G. (1995). Antecedents of multidimensional state anxiety in elite
952 competitive swimmers. *International Journal of Sport Psychology, 26(4)*, 512-
953 523.
- 954 Hardy, J., Thomas, A. V., & Blanchfield, A. W. (2019). To me to you: How you say
955 things matters for endurance performance. *Journal of Sports Science, 37(18)*,
956 2122-2130.

- 957 Hardy, L., & Nelson, D. (1988). Self-regulation training in sport and work. *Ergonomics*,
958 31(11), 1573–83.
- 959 Hatfield, B. D., Spalding, T. W., Mahon, A. D., Slater, B. A., Brody, E. B., & Vaccaro,
960 P. (1992). The effect of psychological strategies upon cardiorespiratory and
961 muscular activity during treadmill running. *Medicine and Science in Sports and*
962 *Exercise*, 24, 218-225.
- 963 Hatzigeorgiadis, A., Bartura, K., Argiropoulos, C., Comoutos, N., Galanis, E., &
964 Flouris, A. D. (2018). Beat the heat: effects of a motivational self-talk
965 intervention on endurance performance. *Journal of Applied Sport Psychology*,
966 30, 388–401.
- 967 Hatzigeorgiadis, A., Zourbanos, N., Latinjak, A., & Theodorakis, Y. (2014). Self-talk.
968 In A. Papaioannou, & D. Hackfort (Eds). *Routledge companion to sport and*
969 *exercise psychology: global perspectives and fundamental concepts*. London
970 England: Taylor Francis. pp. 370-83.
- 971 Hawkins, R. M., Crust, L., Swann, C., & Jackman, P. C. (2020). The effects of goal
972 types on psychological outcomes in active and insufficiently active adults in a
973 walking task: Further evidence for open goals. *Psychology of Sport and Exercise*,
974 48, 101661.
- 975 Hays K. F, & Katchen K. (2006). Reaching out reaching in: Two examples of public
976 education. *Professional Psychology: Research and Practice*, 37(2), 119-124.
- 977 Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive
978 functioning in motivational versus volitional states of mind. *Motivation and*
979 *Emotion*, 11(2), 101-120.

- 980 Hepple, R. T. (2002). The role of O₂ supply in muscle fatigue. *Canadian Journal of*
981 *Applied Physiology*, 27(1), 56-69.
- 982 Hettinga, F. J., Edwards, A. M., & Hanley, B. (2019). The science behind competition
983 and winning in athletics: using world-level competition data to explore pacing
984 and tactics. *Frontiers in Sports and Active Living*, 1:11.
- 985 Hirsch, A., Bieleke, M., Schüler, J., & Wolff, W. (2020). Implicit theories about athletic
986 ability modulate the effects of if-then planning on performance in a standardized
987 endurance task. *International Journal of Environmental Research and Public*
988 *Health*, 17(7), 2576.
- 989 Hopkins, W. G., Schabort, E. J., & Hawley, J. A. (2001). Reliability of power in
990 physical performance tests. *Sports Medicine*, 31, 211–234
- 991 Horstman, D. H., Morgan, W. P., Cymerman, A., & Stokes, J. (1979). Perception of
992 effort during constant work to self-imposed exhaustion. *Perceptual and Motor*
993 *Skills*, 48(3), 1111-1126.
- 994 Howe, A. S., & Boden, B. P. (2007). Heat-related illness in athletes. *American Journal*
995 *of Sports Medicine*, 35(8), 1384-1395.
- 996 Ikai, M., & Steinhaus, A. H. (1961). Some factors modifying the expression of human
997 strength. *Journal of Applied Physiology*, 16, 157-163.
- 998 Ivanova, E., Jensen, D., Cassoff, J., Gu F., & Knauper, B. (2014). Acceptance and
999 Commitment Therapy Improves Exercise Tolerance in Sedentary Women.
1000 *Medicine and Science in Sport and Exercise*, 47, 1251-1258.

- 1001 Jaenes, J. C., Wilczyńska, D., Alarcón, D., Peñaloza, R., Casado, A., & Trujillo M.
1002 (2021) The Effectiveness of the Psychological Intervention in Amateur Male
1003 Marathon Runners. *Frontiers in Psychology*, 12:605130.
- 1004 Johnson, J. H., & Siegel, D. S. (1992). Effects of association and dissociation on effort
1005 perception. *Journal of Sport Behavior*, 15(2), 119-129.
- 1006 Jones, H. S., Williams, E. L., Bridge, C. A., Marchant, D., Midgley, A. W.,
1007 Micklewright, D., & McNaughton, L. R. (2013). Physiological and
1008 psychological effects of deception on pacing strategy and performance: a review.
1009 *Sports Medicine*, 43(12), 1243-1257.
- 1010 Jones, J. G, Swain, A., & Cale, A. (1990). Antecedents of multidimensional competitive
1011 state anxiety and self-confidence in elite intercollegiate middle-distance runners.
1012 *The Sport Psychologist*, 4, 107-118.
- 1013 Jones, M. V., Meijen, C., McCarthy, P. J., & Sheffield, D. (2009). A theory of challenge
1014 and threat states in athletes. *International Review of Sport and Exercise*
1015 *Psychology*, 2, 161–180.
- 1016 Keegan, R. (2016). *Being a sport psychologist*. London, UK: Palgrave Macmillan.
- 1017 LaCaille, R. A., Masters, K. S., & Heath, E. M. (2004). Effects of cognitive strategy and
1018 exercise setting on running performance, perceived exertion, affect, and
1019 satisfaction. *Psychology of Sport and Exercise*, 5, 461-476.
- 1020 Lane, A. M., & Wilson, M. (2011). Emotions and trait emotional intelligence among
1021 ultra-endurance runners. *Journal of Science and Medicine in Sport*, 14(4), 358-
1022 362.

- 1023 Lane, A. M., Devonport, T. J., Friesen, A. P., Beedie, C. J., Fullerton, C. L., & Stanley,
1024 D. M. (2016). How should I regulate my emotions if I want to run faster?
1025 *European Journal of Sports Science, 16*(4), 465-472.
- 1026 Lane, A. M., Devonport, T. J., Stanley, D. M., & Beedie, C. J. (2016). The effects of
1027 brief online self-help intervention strategies on emotions and satisfaction with
1028 running performance. *Sensoria: A Journal of Mind Brain & Culture, 12*(2), 30-
1029 39.
- 1030 Lane, A. M., Terry, P. C., & Karageorghis, C. I. (1995a). Antecedents of
1031 multidimensional competitive state anxiety and self-confidence in duathletes.
1032 *Perceptual and Motor Skills, 80*(3), 911-919.
- 1033 Lane, A. M., Terry, P. C., & Karageorghis, C. I. (1995b). Path analysis examining
1034 relationships among antecedents of anxiety, multidimensional state anxiety, and
1035 triathlon performance. *Perceptual and Motor Skills, 81*(3 suppl), 1255-1266.
- 1036 Lane, A. M., Totterdell, P., MacDonald, I., Devonport, T. J., Friesen, A. P., Beedie, C.
1037 J., Stanley, D., & Nevill, A. (2016). Brief online training enhances competitive
1038 performance: findings of the BBC Lab UK psychological skills intervention
1039 study. *Frontiers in Psychology, 7*:413.
- 1040 Latinjak, A. T., Hatzigeorgiadis, A., Comoutos, N., & Hardy, J. (2019). Speaking
1041 clearly ... 10 years on: The case for an integrative perspective of self-talk in
1042 sport. *Sport and Exercise Performance Psychology, 8*, 353–367.
- 1043 Levine, A., & Buono, M. J. (2019). Rating of perceived exertion increases
1044 synergistically during prolonged exercise in a combined heat and hypoxic
1045 environment. *Journal of Thermal Biology, 84*, 99-102.

- 1046 Lind, E., Welch, A. S., & Ekkekakis, P. (2009). Do ‘mind over muscle’ strategies work?
1047 *Sports Medicine*, 39, 743-764.
- 1048 Locke, E. A., & Latham, G. P. (1985). The application of goal setting to sports. *Journal*
1049 *of Sport Psychology*, 7(3), 205-222.
- 1050 Marcora, S. (2009). Perception of effort during exercise is independent of afferent
1051 feedback from skeletal muscles heart and lungs. *Journal of Applied Physiology*,
1052 106(6), 2060-2062.
- 1053 Marcora, S. M., & Bosio, A. (2007). Effect of exercise-induced muscle damage on
1054 endurance running performance in humans. *Scandinavian Journal of Medicine*
1055 *and Science in Sports*, 17(6), 662-671.
- 1056 Marcora, S. M., & Staiano, W. (2010). The limit to exercise tolerance in humans: mind
1057 over muscle? *European Journal of Applied Physiology*, 109(4), 763-770.
- 1058 Marcora, S. M., Bosio, A., & de Morree, H. M. (2008). Locomotor muscle fatigue
1059 increases cardiorespiratory responses and reduces performance during intense
1060 cycling exercise independently from metabolic stress. *American Journal of*
1061 *Physiology Regulatory, Integrative and Comparative Physiology*, 294(3), R874-
1062 R883.
- 1063 Marcora, S. M., Stanio, W., & Manning, V. (2009). Mental fatigue impairs physical
1064 performance in humans. *Journal of Applied Physiology*, 106(3), 857-864.
- 1065 Markle, A., Wu, G., White, R., & Sackett, A. (2018). Goals as reference points in
1066 marathon running: a novel test of reference dependence. *Journal of Risk and*
1067 *Uncertainty*, 56(1), 19-50.

- 1068 Martin, J. J., & Gill, D. L. (1995). The relationships of competitive orientations and
1069 self-efficacy to goal importance thoughts and performance in high school
1070 distance runners. *Journal of Applied Sport Psychology*, 7, 50–62.
- 1071 Masters, K. S., & Ogles, B. M. (1998). The relations of cognitive strategies with injury
1072 motivation and performance among marathon runners: results from two studies.
1073 *Journal of Applied Sport Psychology*, 10(2), 281-296.
- 1074 Mauger, A. R. (2019). Exercise-induced pain: A psychophysiological perspective. In
1075 C. Meijen (Ed). *Endurance performance in sport: psychological theory and*
1076 *interventions*. Oxon UK: Routledge. pp. 35–46.
- 1077 McCormick, A., Anstiss, P. A., & Lavallee, D. (2020). Endurance athletes' current and
1078 preferred ways of getting psychological guidance. *International Journal of Sport*
1079 *and Exercise Psychology*, 18, 187-200.
- 1080 McCormick, A., & Anstiss, P. (2020). Self-talk and endurance sports. In A.T. Latinjak &
1081 A. Hatzigeorgiadis (Eds.). *Self-talk in sport* (pp. 176-187). Abingdon, England:
1082 Routledge.
- 1083 McCormick, A., & Hatzigeorgiadis, A. (2019). Self-talk and endurance performance. In
1084 C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and*
1085 *interventions* (pp. 153-167). Abingdon, England: Routledge.
- 1086 McCormick, A., Meijen, C., & Marcora, S. (2015). Psychological determinants of
1087 whole-body endurance performance. *Sports Medicine*, 45, 997-1015.
- 1088 McCormick, A., Meijen, C., & Marcora, S. (2018a). Effects of a motivational self-talk
1089 intervention for endurance athletes completing an ultramarathon. *The Sport*
1090 *Psychologist*, 32, 42–50.

- 1091 McCormick, A., Meijen, C., & Marcora, S. (2018b). Psychological demands
1092 experienced by recreational endurance athletes. *International Journal of Sport
1093 and Exercise Psychology, 16*, 415-430.
- 1094 McCormick, A., Meijen, C., Anstiss, P. A., & Jones, H. S. (2019) Self-regulation in
1095 endurance sports: theory research and practice. *International Review of Sport
1096 and Exercise Psychology, 12*, 235-264.
- 1097 Meijen, C., & McCormick, A. (2019). Pursuing the next challenges: Directions for
1098 research on the psychology of endurance performance. In C. Meijen (Ed.),
1099 *Endurance performance in sport: Psychological theory and interventions* (pp.
1100 212-224). Abingdon, England: Routledge.
- 1101 Meijen, C., Day, C., & Hays, K. F. (2017). Running a psyching team: providing mental
1102 support at long-distance running events. *Journal of Sport Psychology in Action,*
1103 *8*, 12–22.
- 1104 Meijen, C., Lane, A. M., McCormick, A., Brick, N., Micklewright, D., Marchant, D., &
1105 Marcora, S. (2018) RESIST: Research-evaluated endurance strategies intending
1106 to support training. Workshop presented at, BPS Division of Sport and Exercise
1107 Psychology Annual Conference, Belfast, UK.
- 1108 Meijen, C., McCormick, A., Anstiss, P. A., & Marcora, S. M. (2021). “Short and sweet”:
1109 A randomized controlled initial investigation of brief online psychological
1110 interventions with endurance athletes. *The Sport Psychologist, 36*, 20-28.
- 1111 Meijen, C., Turner, M., Jones, M. V., Sheffield, D., & McCarthy, P. (2020). A theory of
1112 challenge and threat states in athletes: a revised conceptualization. *Frontiers in
1113 Psychology, 11*:126.

- 1114 Micklewright, D., Angus, C., Suddaby, J., St Clair Gibson, A., Sandercock, G., &
1115 Chinnasamy, C. (2012). Pacing strategy in schoolchildren differs with age and
1116 cognitive development. *Medicine and Science in Sports and Exercise*, *44*(20),
1117 362–369.
- 1118 Micklewright, D., Kegerreis, S., Raglin, J., & Hettinga, F. (2017). Will the conscious–
1119 subconscious pacing quagmire help elucidate the mechanisms of self-paced
1120 exercise? New opportunities in dual process theory and process tracing methods.
1121 *Sports Medicine*, *47*(7), 1231-1239.
- 1122 Micklewright, D., Papadopoulou, E., Parry, D., Hew-Butler, T., Tam, N., & Noakes, T.
1123 (2009). Perceived exertion influences pacing among ultramarathon runners but
1124 post-race mood change is associated with performance expectancy. *South*
1125 *African Journal of Sports Medicine*, *21*(4), 167-172.
- 1126 Micklewright, D., Papadopoulou, E., Swart, J., & Noakes, T. (2010). Previous
1127 experience influences pacing during 20 km time trial cycling. *British Journal of*
1128 *Sports Medicine*, *44*(13), 952-960.
- 1129 Micklewright, D., Parry, D., Robinson, T., Deacon, G., Renfree, A., St Clair Gibson, A.,
1130 & Matthews, W. J. (2015). Risk perception influences athletic pacing strategy.
1131 *Medicine and Science in Sports and Exercise*, *47*(5), 1026-1037.
- 1132 Mooneyham, B. W., & Schooler, J. W. (2013). The cost and benefits of mind-
1133 wandering: a review. *Canadian Journal of Experimental Psychology*, *67*, 11-18.
- 1134 Moore, I. S. (2016). Is there an economical running technique? A review of modifiable
1135 biomechanical factors affecting running economy. *Sports Medicine*, *46*, 793-807.

- 1136 Moore, I. S., Phillips, D. J., Ashford, K. J., Mullen, R., Goom, T., & Gittos, M. R. J.
1137 (2019). An interdisciplinary examination of attentional focus strategies used
1138 during running gait retraining. *Scandinavian Journal of Medicine and Science in*
1139 *Sports*, 29(10), 1572-1582.
- 1140 Morales-Alamo, D., Losa-Reyna, J., Torres-Peralta, R., Martin-Rincon, M., Perez-
1141 Valera, M., Curtelin, D., Ponce-González, J. G., Santana, A., & Calbet, J. A.
1142 (2015). What limits performance during whole-body incremental exercise to
1143 exhaustion in humans? *Journal of Physiology*, 593(20), 4631–4648.
- 1144 Morgan, W. P., & Pollock, M. L. (1977). Psychologic characterization of the elite
1145 distance runner. *Annals of the New York Academy of Science*, 301(1), 382-403.
- 1146 Nicholls, A. R., Levy, A. R., Carson, F., Thompson, M. A., & Perry, J. L. (2016). The
1147 applicability of self-regulation theories in sport: Goal adjustment capacities
1148 stress appraisals coping and well-being among athletes. *Psychology of Sport and*
1149 *Exercise*, 27, 47–55.
- 1150 Nietfeld, J. L. (2003). An examination of metacognitive strategy use and monitoring
1151 skills by competitive middle distance runners. *Journal of Applied Sport*
1152 *Psychology*, 15, 307-320.
- 1153 Oettingen, G., & Gollwitzer, P. M. (2010). Strategies of setting and implementing goals:
1154 mental contrasting and implementation intentions. In J. E. Maddux, & J. P.
1155 Tangney (Eds). *Social psychological foundations of clinical psychology*. New
1156 York: Guilford Press. pp. 114-135.
- 1157 Ogles, B. M., & Masters, K. S. (2003). A typology of marathon runners based on cluster
1158 analysis of motivations. *Journal of Sport Behavior*, 26(1), 69–85.

- 1159 Parry, D., Chinnasamy, C., & Micklewright, D. (2013). Optic flow influences perceived
1160 exertion during cycling. *Journal of Sport and Exercise Psychology*, *34*(4), 444-
1161 456.
- 1162 Patrick, T. D., & Hrycaiko, D. W. (1998). Effects of a mental training package on an
1163 endurance performance. *The Sport Psychologist*, *12*, 283-299.
- 1164 Poczwardowski, A., Sherman, C. P., & Ravizza, K. (2004). Professional philosophy in
1165 the sport psychology service delivery: Building on theory and practice. *The Sport*
1166 *Psychologist*, *18*, 445-463.
- 1167 Pollak, K. A., Swenson, J. D., Vanhaisma, T. A., Huguen, R. W., Jo, D., White, A. T.,
1168 Light, K. C., Schweinhardt, P., Amann, M., & Light, A. R. (2014). Exogenously
1169 applied muscle metabolites synergistically evoke sensations of muscle fatigue
1170 and pain in human subjects. *Experimental Physiology*, *99*(2), 368-380.
- 1171 Pope, J. P., Stewart, N. W., Law, B., Hall, C. R., Gregg, M. J., & Robertson, R. (2015).
1172 Knowledge translation of sport psychology to coaches: coaches' use of online
1173 resources. *International Journal of Sports Science Coaching*, *10*, 1055-1071.
- 1174 Renfree, A., Martin, L., Micklewright, D., & St Clair Gibson, A. (2014). Application of
1175 decision-making theory to the regulation of muscular work rate during self-paced
1176 competitive endurance activity. *Sports Medicine*, *44*(2), 147-158.
- 1177 Scheerder J., Breedveld K., & Borgers, J. (2015) Who is doing a run with the running
1178 boom? The growth and governance of one of Europe's most popular sport
1179 activities. In J. Scheerder, K. Breedveld, J. Borgers (Eds). In running across
1180 Europe. London: Palgrave Macmillan. pp. 1-27

- 1181 Scholz, U., Nagy, G., Schüz, B., & Ziegelmann, J. P. (2008). The role of motivational
1182 and volitional factors for self-regulated running training: associations on the
1183 between- and within- person level. *British Journal of Social Psychology, 47*,
1184 421-439.
- 1185 Schüler, J., & Langens, T. A. (2007) Psychological crisis in a marathon and the
1186 buffering effects of self-verbalizations. *Journal of Applied Social Psychology*,
1187 37, 2319-2344.
- 1188 Senécal, J., Loughhead, T. M., & Bloom, GA. (2008). A season-long team-building
1189 intervention: Examining the effect of team goal-setting on cohesion. *Journal of*
1190 *Sport and Exercise Psychology, 30*, 186-199.
- 1191 Sheard, M., & Golby, J. (2006). Effect of a psychological skills training program on
1192 swimming performance and positive psychological development. *International*
1193 *Journal of Sport and Exercise Psychology, 4*(2), 149-69.
- 1194 Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and Personal*
1195 *Psychology Compass, 10*(9), 503-518.
- 1196 Smirmaul, B. P., de Moraes, A. C., Angius, L., & Marcora, S. M. (2017). Effects of
1197 caffeine on neuromuscular fatigue and performance during high-intensity
1198 cycling exercise in moderate hypoxia. *European Journal of Applied Physiology*,
1199 117(1), 27-36.
- 1200 Smith, A. L., Gill, D. L., Crews, D. J., Hopewell, R., & Morgan, D. W. (1995).
1201 Attentional strategy use by experienced distance runners: physiological and
1202 psychological effects. *Research Quarterly in Exercise and Sport, 66*, 142-150.

- 1203 Southward, K., Rutherford-Markwick, K. J., & Ali, A. (2018). Correction to: the effect
1204 of acute caffeine ingestion on endurance performance: a systematic review and
1205 meta-analysis. *Sports Medicine*, 48(10), 2425-2441.
- 1206 St Clair Gibson, A., Lambert, E. V., Rauch, L. H. G., Tucker, R., Baden, D. A., Foster,
1207 C., & Noakes, T. D. (2006). The role of information processing between the
1208 brain and peripheral physiological systems in pacing and perception of effort.
1209 *Sports Medicine*, 36(8), 705-722.
- 1210 Staiano, W., Bosio, A., de Morree, H. M., Rampinini, E., & Marcora, S. (2018). The
1211 cardinal exercise stopper: Muscle fatigue muscle pain or perception of effort?
1212 *Progress in Brain Research*, 240, 175–200.
- 1213 Stanley, C., Pargman, D., & Tenenbaum, G. (2007). The effect of attentional coping
1214 strategies on perceived exertion in a cycling task. *Journal of Applied Sport*
1215 *Psychology*, 19, 352-363.
- 1216 Stanley, D. M., Lane, A. M., Beedie, C. J., Friesen, A. P., & Devonport, T. J. (2012).
1217 Emotion regulation strategies used in the hour before running. *International*
1218 *Journal of Sport and Exercise Psychology*, 10, 159-171.
- 1219 Swann, C., Hooper, A., Schweickle, M. J., Peoples, G., Mullan, J., Hutto, D., Allen, M.
1220 S., & Vella, S. A. (2020). Comparing the effects of goal types in a walking
1221 session with healthy adults: preliminary evidence for open goals in physical
1222 activity. *Psychology of Sport and Exercise*, 47, 101475.
- 1223 Tatterson, A. J., Hahn, A. G., Martin, D. T., & Febbraio, M. A. (2000). Effects of heat
1224 stress on physiological responses and exercise performance in elite cyclists.
1225 *Journal of Science and Medicine in Sport*, 3, 186–193

- 1226 Taylor, I. M., Boat, R., & Murphy, S. L. (2018). Integrating theories of self-control
1227 and motivation to advance endurance performance. *International Review of*
1228 *Sport and Exercise Psychology*, 13(1),1-20.
- 1229 Tenenbaum, G., & Connolly, C. T. (2008). Attention allocation under varied workload
1230 and effort perception in rowers. *Psychology of Sport and Exercise*, 9, 704-717.
- 1231 Tenenbaum, G., Spence, R., & Christensen, S. (1999). The effect of goal difficulty and
1232 goal orientation on running performance in young female athletes. *Australian*
1233 *Journal of Psychology*, 51, 6–11.
- 1234 Terry, P. C., Karageorghis, C. I., Curran, M. L., Martin, O. V., & Parsons-Smith, R. L.
1235 (2020). Effects of music in exercise and sport: A meta-analytic
1236 review. *Psychological Bulletin*, 146(2), 91-117.
- 1237 The British Psychological Society (2019). *Standards for the accreditation of Masters &*
1238 *Doctoral programmes in sport and exercise psychology*.
1239 [https://www.bps.org.uk/sites/www.bps.org.uk/files/Accreditation/Sport%20and](https://www.bps.org.uk/sites/www.bps.org.uk/files/Accreditation/Sport%20and%20Exercise%20Accreditation%20Handbook%202019.pdf)
1240 [%20Exercise%20Accreditation%20Handbook%202019.pdf](https://www.bps.org.uk/sites/www.bps.org.uk/files/Accreditation/Sport%20and%20Exercise%20Accreditation%20Handbook%202019.pdf)
- 1241 Thelwell, R. C., & Greenlees, I. A. (2001). The effects of a mental skills training
1242 package on gymnasium triathlon performance. *The Sport Psychologist*, 5, 127-
1243 141.
- 1244 Thelwell, R. C., & Greenlees, I. A. (2003). Developing competitive endurance
1245 performance using mental skills training. *The Sport Psychologist*, 17, 318-337.
- 1246 Theodorakis, Y., Laparidis, K., & Kioumourtzoglou, E. (1998). Combined effects of
1247 goal setting and performance feedback on performance and physiological

- 1248 response on a maximum effort task. *Perceptual and Motor Skills*, 86, 1035–
1249 1041.
- 1250 Thompson, K., Maclaren, D., Lees, A., & Atkinson, G. (2003). The effect of even
1251 positive and negative pacing on metabolic, kinematic and temporal variables
1252 during breaststroke swimming. *European Journal of Applied Physiology*, 88(4),
1253 438-443.
- 1254 Tucker, R., & Noakes, T. D. (2009). The physiological regulation of pacing strategy
1255 during exercise: a critical review. *British Journal of Sports Medicine*, 43(6), e1.
- 1256 Uphill, M. A., & Jones, M. V. (2007). Antecedents of emotions in elite athletes.
1257 *Research Quarterly in Exercise and Sport*, 78(2), 79-89.
- 1258 van der Linden, D. (2011). The urge to stop: The cognitive and biological nature of
1259 acute mental fatigue. In P. L. Ackerman (Ed.), *Decade of Behavior/Science*
1260 *Conference. Cognitive fatigue: Multidisciplinary perspectives on current*
1261 *research and future applications* (p. 149–164). American Psychological
1262 Association.
- 1263 Venhorst, A., Micklewright, D., & Noakes, T. D. (2018). Towards a three-dimensional
1264 framework of centrally regulated and goal-directed exercise behaviour: a
1265 narrative review. *British Journal of Sports Medicine*, 52(15), 957-966.
- 1266 Wallace, P. J., McKinlay, B. J., Coletta, N. A., Vlaar, J. I., Taber, M. J., Wilson, P. M.,
1267 & Cheung, S. S. (2017). Effects of motivational self-talk on endurance and
1268 cognitive performance in the heat. *Medicine and Science in Sports and Exercise*,
1269 49, 191-199.

- 1270 Walton, G. M. (2014). The New Science of Wise Psychological Interventions. *Current*
1271 *Directions in Psychology Science*, 23(1), 73–82.
- 1272 Webb, T. L., Schweiger Gallo, I., Miles, E., Gollwitzer, P. M., & Sheeran, P. (2012).
1273 Effective regulation of affect: an action control perspective on emotion
1274 regulation. *European Review of Social Psychology*, 23(1), 143–186.
- 1275 Weinberg, R. S. (1994). Goal setting and performance in sport and exercise settings.
1276 *Medicine and Science in Sport and Exercise*, 26(4), 469-477.
- 1277 Westwood, C. S., Fallowfield, J. L., Delves, S. K., Nunns, M., Ogden, H. B., &
1278 Layden, J. D. (2021). Individual risk factors associated with exertional heat
1279 illness: A systematic review. *Experimental Physiology*, 106, 191-199.
- 1280 Zimmerman, B. J. (2000). Attaining self-regulation: a social cognitive perspective. In
1281 M. Boekaerts, P. R. Pintrich, M. Zeidner (Eds). *Handbook of self-regulation*. San
1282 Diego CA: Academic Press. pp. 13-39.
- 1283
- 1284

**Psychological Strategies to Resist Slowing Down or Stopping during Endurance Activity:
An Expert Opinion Paper**

Appendix 1

Appendix 1. Descriptive overview of intervention studies relating to resisting slowing down or stopping

Intervention	Study	Participant information	Design overview	Endurance task	Intervention information	Outcome relating to resisting slowing down or stopping
Goal setting	Tenenbaum et al. (1999)	28 female, secondary-school, cross-country runners (age = 14.6 ± 1.2).	Pretest-posttest design with three experimental groups and no control. Ps were assigned by block randomisation.	Running 2.3 km run on a road course.	Assignment of an easy, challenging, or unrealistic combination of short-term and long-term goals (5%, 10%, or 15% improvement in four weeks, with weekly targets). Goals were private and assigned verbally on an individual basis.	Each group's best post-intervention performance was significantly faster than baseline ($M = 7.8\%$). Improvements did not significantly differ between groups.
	Theodorakis et al. (1998)	40 university students (f = 23, m = 17, age = 20.3 ± 2.1).	Pretest-posttest design with a control group.	Cycling Incremental test on an ergometer.	Goal setting and performance feedback. Ps set a specific goal (orally and in writing) for improved performance. Elapsed time was displayed during performance.	The goal setting group showed a significantly greater increase in endurance performance ($M = 12.3\%$ / 110.4 s) compared to the control ($M = 1.9\%$).
Motivational self-talk	Blanchfield et al. (2014)	24 recreationally trained individuals (f = 9, m = 15, age = 24.6 ± 7.5).	Pretest-posttest design with a randomised control group.	Cycling Time-to-exhaustion test on an ergometer.	Two-stage self-talk intervention delivered over two weeks using a workbook. Stage 1 = Introduction to self-talk and selection of four motivational self-talk statements. Stage 2 = Using self-talk during three or more exercise sessions.	Time to exhaustion significantly increased in the self-talk group ($M = 17.9\%$ / 114 s), but not in the control (-2.5%).

Motivational self-talk (continued)	Wallace et al. (2017)	18 trained cyclists (m = 14, f = 4, age range = 18-50).	Pretest-posttest design with a randomised control group.	Cycling Time-to-exhaustion test on an ergometer in hot conditions.	Two-stage self-talk intervention delivered over two weeks using a workbook. Stage 1 = Introduction to self-talk, identification of their own negative self-talk, and selection of five motivational self-talk statements. Stage 2 = Using self-talk during three training sessions, over two weeks.	Self-talk significantly increased time-to-exhaustion by 39.4% (from 487 to 679 s). There was not a significant difference for the control group (from 531 to 510 s).
	Barwood et al. (2015)	14 recreationally-active males (age = 19 ± 1).	Pretest-posttest design with a control group. Ps were matched before assignment.	Cycling 10 km time trial on an ergometer.	One-hour classroom session with a structured workbook. Ps identified their negative self-talk statements and chose motivational statements to counter these with during each 2 km section. Ps rehearsed statements during the days and moments preceding each time trial.	Motivational self-talk significantly improved time-trial performance (M = 3.75%). Neutral self-talk did not (M = -1.30%).
	Hatzigeorgisdis et al. (2018)	16 male sport science students (age = 22.5 ± 4.9).	Randomised, controlled, posttest-only experimental design.	Cycling 30 min constant duration test in hot conditions at a steady RPE.	Ps received a brief introduction on the use of self-talk strategies. Then they chose cues from a list of motivational cues typically used to boost motivation and effort, or they devised their own. Ps were asked to use self-talk every two minutes during the test.	Ps in the self-talk group produced significantly greater power output during the final third of the trial, compared to the control.

Motivational self-talk (continued)	McCormick et al. (2018)	29 ultramarathon runners (m = 25, f = 4, age = 39.3 ± 8.4).	Randomised, controlled, posttest-only experimental design.	Running Self-supported, overnight, 60-mile ultramarathon.	Workbooks introduced self-talk, asked Ps to notice their self-talk and its impact, and choose four new statements to use during the ultramarathon. Ps practiced self-talk in training runs for approximately two weeks.	The difference in performance times was not statistically significant. The mean performance time of the self-talk group (824 minutes, SD = 97) was 12 minutes (1.44%) faster than the control group.
	de Matos et al. (2021)	21 recreational triathletes (m = 15, f = 6, age M = 32.7, age range = 21-47).	Pretest-posttest design with randomisation to one of two intervention groups.	Swimming 750 m swim in a 50 m pool.	The motivational group used four motivational sentences to improve effort, confidence, and psyching up. The instructional group used four sentences to improve focus, technique, and pace. A practitioner made the sentences based on reported dysfunctional thoughts, and distributed via printed guides and WhatsApp. Ps had 12 days to rehearse in training. Ps used sentences after dysfunctional thoughts.	Motivational self-talk led to a significant 2.8% improvement in 750 m swimming performance (from 821 to 797 s). Instructional self-talk did not lead to a statistically-significant effect (0.39% improvement, 799 to 796 s).
	Hardy et al. (2019)	16 recreationally active males (age = 22.0 ± 3.0).	Randomised, repeated-measures design.	Cycling 10 km time trial on an ergometer.	A workbook was used to raise Ps' awareness of their self-talk, and to change negative self-talk into motivational and positive self-talk. Ps used self-talk for each 2km stage and	Ps performed 2.2% faster (M = 1045 s) when in the second-person condition, compared to the first-person

					to counter negative self-talk. Self-talk was either in first person (e.g., “I can tolerate this”) or second person (e.g., “You can tolerate this”).	self-talk condition (M = 1068 s).
Motivational self-talk (continued)	Schüler and Langens (2007)	110 non-professional marathon runners (m=91, f=19).	Randomised, controlled, posttest-only experimental design.	Running A real-life marathon.	Ps chose a self-verbalisation to use during the marathon, which was either their own or from a list that related to self-encouragement, anticipation of positive outcomes, and self-calming.	Ps who had a large ‘psychological crisis’ achieved significantly faster running times when they used self-verbalizations than when they did not use them. There was no difference for Ps who had a small ‘crisis’.
	DeWolfe et al. (2021)	93 university students (m =53, f = 40, age 20.4 ± 2.4)	Between groups design with random assignment (with matching) to three experimental conditions and a neutral control.	Cycling 20-minute ‘do your best’ constant duration test.	Before the cycling task, Ps created ST statements with the researcher for their assigned condition. Self-talk was motivational (e.g., “Keep it up”), neutral (e.g., “The bike is red”), negative/discouraging (e.g., “My legs are tired”), or challenging (the same type of discouraging words as the negative group, but with a statement to embrace negative self-talk as a challenge, e.g., “My legs are tired, but I can push through it”).	The challenging self-talk group (M = 2.0 km; SD = 0.3) covered significantly greater distance than the negative ST group (M = 1.8 km; SD = 0.3) in time block four. No other significant differences were present between groups at the various time points.
Relaxation	Hatfield et al. (1992)	12 male intercollegiate cross-country	Counterbalanced repeated-measures design with two experimental	Running 3 x 12 min blocks of treadmill	Biofeedback: Ps were provided with ventilation and EMG biofeedback.	RPE was lower in the biofeedback (12.5 ± 0.5) and distraction (12.5 ± 0.7)

		runners (age = 22.2 ± 1.3).	conditions and a no-instruction control.	running just below ventilatory threshold.	Distraction: Ps were required to press a button on a hand-held device, timing the button press to coincide with the illumination of the final light in a series. Trials presented every 4s.	conditions than control (13.04 ± 0.6).
Relaxation (continued)	Brick et al. (2018)	24 club-level endurance runners (m = 13, f = 11, age 44.6 ± 10.8).	Randomised, repeated-measures design with three experimental conditions and a no-instruction control.	Running 4 x 6 min blocks on a treadmill at 70% of maximum oxygen uptake.	Brief instructions to focus on smiling, frowning, relaxing their hands and upper body, or no-instruction control.	RPE higher when frowning (12.29 ± 1.88), compared to smiling (11.25 ± 1.94) and relaxing (11.38 ± 1.76). No differences in RPE between any other pairs of conditions.
Distractive strategies	Johnson and Siegel (1992)	44 college females (age = 21.3 ± 4.9).	Between groups design with random assignment to three experimental conditions and a control.	Cycling 15 minutes cycling at 60% of predicted maximum oxygen uptake.	Instruction given immediately before task performance. Association: focus on physical symptoms. Internal dissociation: recall names. External dissociation: hold conversation. Control: No instruction	RPE was significantly higher for association (15.4) than internal dissociation (12.0). No difference in RPE between internal dissociation, external dissociation, and control.
	Stanley et al. (2007)	13 female exercisers (age = 20.1 ± 1.75).	Repeated-measures design with four sequential	Cycling 10 min bout at 75%	Internal association: Asked to focus on their form, breathing, perspiration, and how their muscles felt.	RPE was higher in internal (13.74 ± 1.25, on 6-20 scale) and external (14.03 ± 1.01) associative conditions than

			experimental conditions.	maximum oxygen uptake.	Internal dissociation: Watched a self-selected video. External association: Asked to focus on the ergometer digital readings. External dissociation: Asked to pay attention to the gymnasium.	internal (12.95 ± 1.46) and external (12.95 ± 0.91) dissociative conditions. No difference between internal and external conditions.
Distractive strategies (continued)	Connolly and Janelle (2003) Study 1	8 female varsity rowers (age = 19.9 ± 1.31).	Counterbalanced, repeated-measures design.	Rowing. 20 min aerobic row at 'steady state' or '75% pressure'	Association: Instructed to focus on their breathing, body, and technique. Dissociation: Instructed to focus on collages.	Ps rowed 1.9% further when using association (4369.8m) than dissociation (4286.5m). No significant difference between RPE (12.5 and 12.2 respectively, on 6-20 scale).
	Connolly and Janelle (2003) Study 2	22 varsity collegiate rowers (m = 10, f = 12, m age = 19.6 ± 2.0 , f age = 20.3 ± 2.0).	Counterbalanced, repeated-measures design.	Rowing. 2000 m anaerobic ergometer row at 160-180 heart rate.	Internal association: Instructed to focus on their breathing, technique, and body. External association: Instructed to strategize and race against others. Internal dissociation: Instructed to solve maths problems. External dissociation: Instructed to watch a video.	Ps rowed significantly faster in the internal and external association conditions compared to baseline and the internal dissociation condition. RPE was higher in the internal and external association conditions than baseline. There was no difference between the four attention conditions for RPE.

	LaCaille et al. (2004)	60 people who run (m = 22, f = 38, age = 26.8 ± 8.9).	A 3 x 2 x 2 mixed experimental design (exercise setting x cognitive strategy x gender)	Running 5km run	Exercise setting: treadmill, indoor track, and outdoor route. Cognitive strategies: Association or dissociation. Association involved monitoring their heart rate, and dissociation involved listening to music.	The association group ran faster (26.1 ± 4.39 minutes versus 27.9 ± 3.94 minutes). No overall differences in RPE between the cognitive strategies.
Multi-modal interventions	Barwood et al. (2008)	18 males (PST age = 23 ± 3, control age = 28 ± 5).	Pretest-posttest design with a control group. Ps were matched before random assignment.	Running 90 min treadmill constant duration test in hot conditions.	PST package to meet the demands of exercising in the heat. Four one-hour PST sessions were delivered in the four days preceding performance (goal setting, arousal regulation, mental imagery, and positive self-talk).	The PST group ran significantly farther (M = 8% / 1.15 km) after receiving the intervention. The control group ran similar distances in each trial.
	Patrick and Hrycaiko (1998)	3 triathletes of varying ability and 1 national-level runner (m = 4, age range = 25-37).	Single-subject, multiple-baseline design across participants.	Running 1.6 km run on a track.	PST package delivered on an individual basis over three days (relaxation, imagery, self-talk, and goal setting). Skills were presented in a self-teaching workbook that contained reading and exercises. The first two sessions lasted 90 minutes, and a third session was dedicated to answering questions.	All Ps improved their performance following the intervention.

	Sheard and Golby (2006)	36 national-level swimmers (f = 23, m = 13, age = 13.9 ± 2.0, age range = 10-18).	Pretest-posttest design without a control group. Ps' best competitive performance times were obtained pre-, post-, and one-month post-intervention.	Swimming Competition performances for different strokes and distances.	PST program. Five weekly sessions were conducted on a one-to-one basis (goal setting, visualisation, relaxation, concentration, and thought stopping). Each session was personalised and lasted 45 minutes.	Performance time was significantly faster in one out of five endurance events post-intervention. Performance times were significantly faster in two endurance events one-month post-intervention.
Multi-modal interventions (continued)	Thelwell and Greenlees (2001)	5 male members of a gymnasium (age = 24.2 ± 4.6).	Single-subject, multiple-baseline design across participants.	Gymnasium triathlon 2 km row, 5 km cycle, 3 km run.	PST package delivered on a one-to-one basis over four consecutive days (goal setting, relaxation, imagery, and self-talk). Each session lasted up to one hour and included education, workbook exercises, and homework.	All Ps improved their performance (M = 32.6 s improvement) following the intervention.
	Thelwell and Greenlees (2003)	4 male members of a gymnasium (age range = 19-21).	Single-subject, multiple-baseline design across participants.	Gymnasium triathlon 2 km row, 5 km cycle, 3 km run.	See Thelwell and Greenlees (2001).	All Ps improved their performance (M = 7.5% / 81 s) following the intervention.
If-then planning	Lane et al. (2016)	147 distance runners (m = 53, f = 94, age = 40.5 ± 9.1).	Randomised, controlled, pretest-posttest design with	Running Self-chosen run, while	Ps made two personalized if-then plans, with an emotion regulation goal. They had two weeks to use their strategies in training.	Neither intervention had a significant effect on performance.

two experimental groups and a control. pursuing a goal. A second group set emotion-focused goals.

f number of female participants, *m* number of male participants, *M* mean, *P(s)* participant(s), *PST* psychological skills training, *RPE* rating of perceived effort, \pm mean \pm standard deviation. Note: Table most recently updated June 2021. The studies included in this table represent the evidence-base of intervention studies cited within the manuscript with an outcome relevant to slowing down or stopping, such as performance during self-paced time trials, exercise time to exhaustion, or perception of effort during fixed-pace tasks.

2

3