

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

Darren Ritchie¹, Justine B. Allen², Andrew Kirkland²

¹ Scottish Athletics, Edinburgh, Scotland

² Faculty of Health Sciences and Sport, University of Stirling, Stirling, Scotland

Submission date: 5th April, 2017

Resubmission date: 15th June, 2017

Acceptance date: 26th July, 2017

Corresponding Author and contact details:

Justine Allen

Email: justine.allen@stir.ac.uk

Address:

Faculty of Health Sciences and Sport,

Pathfoot Building

University of Stirling,

Stirling,

FK9 4LA

United Kingdom

To cite this article: Darren Ritchie, Justine B. Allen & Andrew Kirkland (2017): Where science meets practice: Olympic coaches' crafting of the tapering process, Journal of Sports Sciences, DOI: 10.1080/02640414.2017.1362717

To link to this article: <http://dx.doi.org/10.1080/02640414.2017.1362717>

28 **Where science meets practice: Olympic coaches' crafting of the tapering**
29 **process**

30
31

32 **Abstract**

33 Although there is research providing physiologically-based guidance for the content of the
34 taper, this study was the first to examine how coaches actually implement the taper. The
35 purpose of this study was to examine the taper planning and implementation processes of
36 successful Olympic coaches leading up to major competitions and how they learned about
37 tapering. Seven track and field coaches participated in semi-structured interviews exploring
38 their tapering processes. To be considered for inclusion, coaches were required to have
39 coached one or more athletes to an Olympic or Paralympic medal. Through a process of axial
40 and open coding interview transcripts were analysed and lower and higher order themes
41 developed describing the coaches' tapering processes. Our findings indicate that the strategies
42 employed to achieve the desired physiological adaptations of the taper were consistent with
43 research (e.g., reduction in volume whilst maintaining intensity and frequency). However, our
44 findings also suggest that tapering is far from a straight forward 'textbook' process. The taper
45 was not restricted to physiological outcomes with coaches considering athletes' psychological
46 as well as physical state. Coaches also involved the athlete in the process, adapted the taper to
47 the athlete, continually monitored its progress, and adapted it further as required.

48
49

50 **Keywords:** coaching process, applied sport science, periodisation, psychological preparation

51 **Where science meets practice: Olympic coaches' crafting of the tapering**
52 **process**
53

54 **Introduction**

55 For many coaches and athletes, there is nothing higher on their wish list of
56 accomplishments than to achieve the best performance at the most important competition of
57 the year. Performance coaches and athletes around the world are seeking the optimal training
58 load dose response with the aim of achieving top performances at major events. An important
59 part of the process to achieve these performances is the systematic reduction in the athlete's
60 training load during several days prior to the competition. This period of reduced training is
61 known as the taper (Bompa & Haff, 2009; Mujika & Padilla, 2003).

62 The science, strategy and programme design of tapering have been described in
63 several texts (e.g., Mujika, 2009). Research has also examined the tapering process; using
64 mathematical models (Sanchez, et al., 2013), modeling and simulations (Thomas, Mujika &
65 Busso, 2008) and fundamental physiological training adaptations (Bompa & Haff, 2009;
66 Mujika, 2009). This work almost exclusively focuses on methods to reduce training load and
67 optimise physiological adaptations. It is also used extensively in sports science and coach
68 education to inform how training programmes are designed. There has, however, been limited
69 focus on how these theories are applied in the coaching world. Therefore, the purpose of this
70 study was to examine the taper planning and implementation processes of successful Olympic
71 coaches leading up to major competitions and how they learned and developed their tapering
72 processes. This work is important because the understanding gained could inform sport
73 science practitioners and coaches.

74 According to Lyle (2002), the coach's role is to reduce the unpredictability of
75 performance and this requires planned harmonisation of the contributory elements of the
76 coaching process. The concept of periodisation was developed to assist coaches' planning by

77 breaking down a year into phases (e.g., preparation, competition, taper) and cycles (Bompa,
78 1994; Matveyev, 1981). As a result, different kinds of work could be prioritised at specific
79 periods to build and prepare an athlete to perform to their best at a designated competition
80 (Bompa, 1994; Bosch & Klomp, 2001), whilst also minimising training problems such as
81 staleness, overtraining, burnout, and injury (Kraemer & Bush, 1998; Wathen & Roll, 1994).
82 The taper is part of this periodised programme of training. The purpose of the taper is to
83 maximise the readiness to perform through a balance between reducing the cumulative effects
84 of fatigue (Pyne, Mujika & Reily, 2009) and maintaining fitness (Sanchez et al., 2013). This
85 is generally achieved through a reduction in the athlete's training load prior to the
86 competition (Bompa & Haff, 2009).

87 There has been substantial, largely laboratory-based, research interest into the taper
88 with a number of reviews conducted examining the physiological (Bosquet, Montpetit,
89 Arvisais, & Mujika, 2007; Houmard & Johns, 1994; Mujika, Padilla, Pyne, & Busso, 2004;
90 Sanchez et al., 2013) and performance (Mujika & Padilla, 2003; Mujika et al., 2004) aspects
91 of the taper. In their review, Bosquet and colleagues (2007) confirmed that performance
92 improvement during the taper was more sensitive to reductions in training volume than the
93 manipulation of other training variables, such as training frequency or training intensity.
94 Although the manipulation of training volume is understood by most coaches, many of them
95 fear a potential loss of physical conditioning when training volume is markedly reduced
96 (Pyne et al., 2009), causing a de-training effect (Bompa & Haff, 2009). Many coaches still
97 question how to manipulate the key elements of the taper; type, frequency, duration, and
98 intensity of training, to enhance or optimise performance for a predetermined day (Pyne, et
99 al., 2009). It is perhaps not surprising that this question remains when we consider that,
100 although much of the research examining the taper is based on principles of physiological

101 responses to training adaptations, there has been little examination of how the taper has been
102 applied by coaches as they prepare athletes for competition.

103 The current study aimed to begin to bridge the gap between the science and practice
104 (coaching) of tapering. To do so, a more detailed examination of coaching practice in relation
105 to tapering is needed. Coaching in a performance context is a complex, uncertain, and often
106 ambiguous process (Jones & Wallace, 2005; Ritchie & Allen, 2015). It is “inextricably linked
107 to both the constraints and opportunities of human interaction” (Potrac, Jones, & Armour,
108 2002, p. 184), and is best conceptualised and understood as a series of inter-related and
109 interconnected relationships (Cushion, Armour & Jones, 2006; Lyle, 2002). Research in
110 performance contexts demonstrates that coaches can impact athletes' behaviour, cognitions
111 and affective responses, and influence whether athletes achieve at a high level (Gould,
112 Greenleaf, Dieffenbach, & McCann, 2001; Gould, Guinan, Greenleaf, Medbury, & Peterson,
113 1999; Lara-Bercial & Mallett 2016; Ritchie & Allen, 2015). Furthermore, coaches'
114 perceptions of the factors that enable them to coach effectively in a stressful Olympic
115 environment include the ability to focus on the needs of the individual athlete and adapt their
116 coaching practice according to the individual athlete's progress and responses (Olusoga,
117 Maynard, Hays & Butt, 2012; Ritchie & Allen, 2015).

118 The purpose of this study was to extend our understanding of tapering and coaching
119 practice in preparation for a major competition in performance contexts by examining how
120 successful Olympic and Paralympic coaches plan and implement the taper. In doing so, the
121 study extends our understanding of how the science of tapering is used in real world settings.
122 In addition, understanding the factors that influence the implementation and effectiveness of
123 the taper will assist athletes, coaches, sports science practitioners and researchers in their
124 efforts to optimise performance.

125 **Method**

126 ***Participants***

127 Seven male track and field coaches (e.g., jumps, sprints, and combined disciplines)
128 from the United Kingdom volunteered to participate in the study. They ranged from 47 – 73
129 years of age. To be considered for inclusion in the study, and to ensure the credibility of the
130 data emerging from the interviews, coaches were required to have coached one or more
131 athletes to an Olympic or Paralympic medal (10 gold, 6 silver, 2 bronze). All the coaches had
132 attended between one and ten Olympic or Paralympic Games and between them amassed
133 over 30 Olympic and Paralympic coaching appearances. The participants had been coaching
134 for between 22 and 52 years (average 31 years).

135 ***Procedure***

136 Following university ethical approval and in accordance with the university's ethical
137 procedures for research, initial contact was made through email or a telephone call to each of
138 the participants. The aims of the study and the expected commitment was explained. All the
139 coaches agreed to participate in the study. The participants were assured that their comments
140 would remain anonymous and treated confidentially. Convenient dates and times for the
141 interviews were then agreed. All interviews were conducted by the first researcher.
142 Interviews were carried out either face to face, through Skype or over the telephone. Each
143 interview lasted between 40 and 60 minutes and was digitally audio recorded.

144 ***Data Collection***

145 The views of the participants were gathered through semi-structured interviews.
146 Based on existing coach development literature (e.g., Gilbert, Cote', & Mallett, 2006), a
147 semi-structured interview guide was developed. This contained four sections and ensured that
148 all participants were asked the same set of major questions. Participants were also encouraged
149 to elaborate on their responses. The natural flow of conversation directed the discussion and
150 explored participants' unique experiences in greater depth (Patton, 2002). If needed, sub-

151 questions were used to elicit in-depth information and to ensure that participants had
152 discussed everything they felt relevant before they were moved on to the next section (Patton,
153 2002). Participants were also given the opportunity to add anything they felt was relevant and
154 that was not discussed during the preceding interview sections.

155 The interview guide was divided into four main sections and participants were
156 reminded to focus on their Olympic and Paralympic experiences throughout. The first
157 involved introductory questions about their experience and background, and encouraged
158 participants to talk descriptively (Patton, 2002). The second part of the interview looked at
159 the participants' design and the content of their taper, and the factors taken into consideration
160 when implementing their taper (e.g., what does your tapering process look like? How long is
161 the process? Is there a set pattern, or is the process highly contingent, and why?). The third
162 part of the interview looked at how each of the participants have developed their taper (e.g.,
163 how have you developed this process? What are the challenges you have experienced during
164 the tapering process, and how have you overcome these?). This was followed by questions
165 that looked at the participants' tapering process development (e.g., has anyone or anything
166 specifically helped you develop the tapering process?).

167 *Data analysis*

168 The recorded interviews were transcribed verbatim. In keeping with recognised
169 content analysis procedures (Patton, 2002), the first two researchers, independently
170 familiarised themselves with the transcripts by reading the interview text several times and
171 generated initial meaning units by identifying phrases and comments relevant to the purpose
172 of the study. The analysis was both deductive and inductive using axial and open coding
173 (Patton, 2002). The analysis was deductive in that the overall areas of the study were
174 delineated by the literature and interview guide (e.g., taper content, implementation process).
175 Axial coding was used to find evidence of the coaches' tapering process. Inductive analysis

176 and open coding were used to analyse features of the complex and dynamic process.
177 Following initial coding of the data, preliminary lower order themes were developed. The
178 themes were then discussed between the two researchers and consensus reached on the names
179 of the higher order themes and names as well as appropriate placement of lower order
180 themes. The third researcher acted in the role of 'critical friend' in the final phase of analysis
181 to achieve triangular consensus (Faulkner & Biddle, 2002). The third researcher was not
182 involved with the data collection or initial analysis of data. His role was to confirm, or
183 otherwise, the placement of data into higher order themes.

184 **Results**

185 As a result of the analysis of the coaches' discussion of their tapering process four
186 higher order themes were developed, each comprising a number of lower order themes. The
187 higher order themes were: planned taper (length, load, technical input); crafting the process
188 (how the taper was implemented and adapted); challenges (factors that coaches perceived to
189 affect the effectiveness of the taper); and developmental experiences (e.g., how the coaches
190 had learned and developed their practice of tapering). In Figure 1, an overview of the themes
191 is provided along with the frequency of coaches' responses (cited next to each higher-order
192 and lower-order theme) and meaning units are presented to provide further context to the
193 lower-order themes. While the frequency of coaches' responses does not equate to the
194 importance of the theme, it has been suggested that the most cited themes are more likely to
195 be transferable to other coaches and their tapering process (Weinberg, Butt, & Knight, 2001).
196 In the subsections below all higher-order themes are discussed, with the most cited lower-
197 order themes explored in detail. In addition, descriptive quotes are used to illustrate the
198 themes so that the reader can understand the context of the data (McKenna & Mutrie, 2003).
199 To protect the confidentiality of the coaches, they were assigned a code (i.e., Coach A, Coach
200 B, etc.).

201 *Planned taper*

202 This theme represented the planned content of the taper. It comprised four lower-
203 order themes: taper length (e.g. the period of time identified by the coach for final preparation
204 into the major competition), loading (e.g. coaches' strategies for manipulation of volumes,
205 intensities and training frequency), technical input (e.g. the level of technical focus during the
206 taper), and psychological preparation (e.g., supporting athletes' mental preparation).

207 *Taper length.* The coaches identified different lengths of the tapering process ranging
208 from 7 to 21 days. For example, Coach D explained, "in planning to do well at a major
209 championships then I tend to like a two week clear period of no competition before they
210 compete at the world championships". Coach C commented, "so we normally work between
211 7-10 days."

212 *Loading.* Coaches described the manipulation of loading that helped the athlete
213 physically prepare for the major championships. To achieve a successful taper, the coaches
214 all considered manipulating the training volume, frequency and intensity. Volume was the
215 most cited factor that was manipulated during the taper, specifically, the reduction of training
216 volume. For example Coach C described: "I like to keep the frequency of training the same,
217 the intensity definitely stays, the volume is reduced greatly."

218 *Technical input.* This lower-order theme represented responses from coaches
219 explaining technical considerations during the taper and comprised three meaning units:
220 quantity (e.g. number of coaching points); quality (e.g. complexity of technical points, and
221 execution); and contingent (e.g. variable technical focus based on the coach's emphasis at
222 that time). One of the most frequently cited meaning units highlighted the importance
223 considering carefully how much technical information was being provided at this time.
224 Specifically, coaches explained "that it was important to keep the number of technical points
225 to a minimum because you don't want to cloud them with too many things to think about"

226 (Coach G). Six coaches also emphasised the importance of not adding any new technical
227 elements during this phase. Coach F explained:

228 From a technical perspective, from late May, that's it, I'm done tinkering. Whatever
229 I've got, that's what I've got. Which means we go into competition and I'm trying to
230 get the jumper to work with what they have, as well as they can.

231 The quality of execution of the event was also important during this phase.
232 Specifically, the coaches would look at the event as a whole, "practicing the skill itself in the
233 right context rather than breaking the elements down" (Coach F). Coach C explained that
234 they would keep the technical element very simple by "going back to basics, and take them
235 back to what I call fundamentals." Coach D discussed that any technical work carried out
236 during the taper was, "more about rehearsal and refinement rather than being technical."

237 *Psychological preparation.* The coaches explained that the training objectives of the
238 taper were not only based on physiological responses. Psychological factors were also
239 considered when planning the training content, suggesting that "a lot of tapering is about
240 confidence" (Coach B). The coaches felt that the role of installing confidence in the athletes
241 in the preparation for the major competition was vital for an effective taper. This was
242 explained by Coach D who stated that, "as well as the physical tapering, there is the
243 psychological tapering as well, if you like, which is about confidence giving." The coaches
244 described how mentally preparing athletes for the 'big stage' was a conscious role performed
245 during the taper: "we have to get athletes where they are empowered and mentally strong,
246 because when they are in the stadium they have to be strong mentally" (Coach C). Coach F
247 explained that,

248 I only say the right things that are positive in nature, I use evidence from training to
249 bolster their confidence... I am using real life information that they can relate to. That
250 would give them real confidence, rather than a superfluous thing.

251 *Crafting the process*

252 How the coaches implemented and adapted the tapering process comprised three
253 lower-order themes: adaptations to planned content (e.g. factors that influenced the training
254 content), monitoring the process (e.g. strategies employed by coaches to assess and manage
255 the effectiveness of the taper), and athlete collaboration (e.g., input from athletes that
256 influenced the taper). The importance of reflecting on and adapting the tapering process
257 throughout was emphasised by all the coaches. For example, coaches described that whilst
258 the outline of their training during the taper was scripted “with a set structure” (Coach G), in
259 each session it was “highly contingent” (Coach A). Coaches explained that the content “tends
260 to be a bit ad-hoc” (Coach D) and “very touchy feely” (Coach B) [dependent on the athlete’s
261 responses during the taper]. Coach B explained further:

262 There is a formula to it, but it is not as prescriptive as that. There are 3 or 4 core
263 sessions that I want to get in, and what I do a lot of is ask the athlete, what do you
264 want to do, and it becomes that.

265 *Adapting the planned content.* This lower-order theme comprised responses from
266 coaches identifying factors that influenced the training content of the taper and contained four
267 meaning units: Athlete characteristics (e.g. based on the individual athlete); confidence
268 building (e.g., use of specific sessions to boost confidence); prior preparation (e.g. the
269 training carried out leading into the taper); and context (e.g. tapering for a major
270 championship or the championship trials). The athlete’s characteristics was a key factor in
271 deciding the content delivered during the tapering phase. For example, Coach C highlighted
272 that the “specifics are quite individual for each athlete” and “it all depends on the type of
273 athlete.” A common factor that influenced the taper was the athlete type. For example, Coach
274 E explained:

275 I don't have a set taper length, because it varies upon the individual. If we talk about
276 400m, there are two types of individual; this is the more speed based and one that's
277 strength based. With the strength based athlete, I would taper much closer to the
278 championships, their volume of work will stay higher for longer, it should be around 7
279 days. Whereas with the speed based person who is neurally wired, it would be
280 between 10 and 14 days.

281 One of the most cited considerations for the adapting the content of training sessions
282 during the taper was the inclusion of confidence building sessions when needed. Coach E
283 explained:

284 There will be certain sessions that the athlete feels they respond best to. Every athlete
285 has a 'go to' session, if things aren't going very well. So we have sessions where the
286 athlete done particularly well, and in that window they PB'd [recorded a personal best
287 time or distance]. So they can relate a session to a PB. The way I see it, tapering is
288 about understanding the athlete. That for me counts for everything. Confidence is the
289 big thing.

290 Six coaches felt that the preparation work in the build up to the taper was an important
291 factor in deciding the content of the taper. For example Coach E explained the importance of
292 the preparation phase: "Whether you start from 14, 10, 7 days out, it depends on what
293 happened in the two months prior to that. I don't think you can divorce the tapering from the
294 preparation."

295 *Monitoring the process.* This lower-order theme comprised strategies employed by
296 coaches to assess and manage the effectiveness of the taper, enabling them to adapt the
297 process during this phase. This theme contained five meaning units: performance outcome
298 (e.g. the athletes' performance on the day of competition), observation (e.g. the assessment of
299 the athlete against the coach's mental model), psychological state (e.g., provision or not of

300 feedback), performance analysis (e.g. the use of video analysis during the taper), and
301 nutrition (e.g. the monitoring of the athlete's body weight and hydration levels). The
302 performance outcome of the athlete was the most frequently cited response to the monitoring
303 of the tapering process. One coach of jumps athletes simply commented, "my monitoring
304 process is height achieved" (Coach A). Closely connected to this was observation. Coaches
305 described how they would assess the athlete against where they expected them to be, or
306 against their technical model for that athlete. Coach F explained:

307 I could use omega waves, which tells you when you are in the best shape of your life.
308 I haven't got into that at all, I have relied upon what I see and what the athletes are
309 doing throughout the process.

310 During the taper coaches paid attention to the athletes' psychological state, including
311 athlete's confidence, carefully considering the timing and content of feedback, and ensuring
312 both coach and athlete are realistic in the performance expectations. Coach B explained that,
313 "you are dealing with human beings. And this is that art of coaching; when to say something
314 and when to not."

315 *Athlete collaboration.* This lower-order theme represented the extent to which the
316 taper was a collaborative process between coach and athlete. There were three meaning units
317 comprising this lower order theme: coach-athlete relationship (e.g., how they work together),
318 athlete input (e.g., athlete's preferences based on their own experiences, feedback from the
319 athlete), and coach or athlete led (e.g. content was coach or athlete led).

320 The quality of the working relationship between coach and athlete, "how we interact
321 with each other" (Coach E), was seen as critical for an effective tapering process. Coaches
322 highlighted the importance of being "honest with the athletes and praising them when praise
323 was due" and "being there for the athlete" (Coach G). It was also important that athletes had
324 confidence in the coach and they worked together. Coach A explained that one of the reasons

325 their taper was not successful was because the athlete didn't have any confidence in the coach
326 and the relationship broke down:

327 The athlete became less of a believer in subtlety, and more a believer of hard work, so
328 he wanted to go to the major champs feeling strong, and I wanted him to go to the
329 major champs feeling fresh. In the end the athlete did not perform at the major
330 championships, and that's why our relationship ended.

331 Five coaches explained that the athlete was involved in deciding the content of the
332 taper. The level of athlete involvement varied with each coach but was usually based on the
333 experience of the athlete. For example Coach D described:

334 Beginner athletes going into the U20 European or World U20, if it's their first time,
335 they will need a fair degree of direction and will rely on the coach's expertise if the
336 coach has it. With an experienced athlete, going into the World Championships for
337 example, they will very much prescribe what programme they want to do and I'm a
338 helper in that programme, because they have been through it and they know what
339 works.

340 This input also extended to coaches' value of feedback from the athlete during the
341 taper. Coach C explained that, "I think the athlete has to be empowered to give you
342 feedback." However, again, this also depended on the athlete's experience, with more
343 credence given to feedback from more experienced athletes compared with less experienced
344 athletes. For example, Coach D explained, "It depends on the experience of the athlete really
345 as to what feedback and advice you take."

346 ***Challenges***

347 This higher-order theme comprised factors that coaches perceived to have an impact
348 on the effectiveness of the taper. There were three lower-order themes: psychological (e.g.
349 psychological state of the athlete, coach or team staff), physical (e.g. athlete injury or the

350 training preparation leading into the taper), and external commitments (e.g. media or
351 commercial and competition agents).

352 *Psychological.* The largest of the lower-order themes comprised responses describing
353 the psychological factors that were the biggest challenge for coaches during the taper and
354 were categorised into the following meaning units: psychological state (e.g. over/under
355 confidence, coping with nervousness, athlete focused on other people, irrational behaviours
356 of coaches, athletes, and team staff), environment (e.g. factors athletes and coaches are
357 exposed to in the holding camp and village), and conflict (e.g. between coach and athlete, or
358 with head coach).

359 One of the largest meaning units was the psychological state of athletes, coaches and
360 team staff. All seven coaches identified the challenges of athletes obtaining and maintaining
361 an optimal psychological state, including the effects of over and under confidence, “dealing
362 with boredom” (Coach B), and maintaining a focus on the athlete’s own preparation. Coach
363 A cited examples of both over and under confidence from two different athletes, and how this
364 affected their performance:

365 I remember doing a session with [athlete 1], and he looked amazing. And he said after
366 this time next week my life is going to be different. And it was a revelation, because
367 he knew he was going to get an Olympic medal, he just didn’t know what colour.
368 Now interestingly he messed it up. He was in a brilliant place mentally, too brilliant,
369 he was too cocky. However with [athlete 2], he was lacking in confidence, and I saw
370 him talking himself out of the competition leading into the Olympics. So the biggest
371 issues are over confidence and under confidence.

372 Coach E explained the importance of staying focused on the athlete’s own preparation
373 rather than what other athletes were doing. This was particularly important with younger
374 athletes, or those preparing for the major championship for the first time:

375 The big danger is getting wrapped up in other people's preparation, and that you see
376 someone doing something and the athlete wants to join them. I have also witnessed
377 athletes 'performing' in training in front of other athletes, specifically their
378 competitors to try and psych them out. So the challenges during the taper are being
379 surrounded by your opposition and not pumping up the volume.

380 The mental state of the coach could also be a challenge because it could affect how
381 the coach behaved. Coach B explained that "I think you have got to look at yourself as a
382 coach in that period of time at your own behaviours." Coach B went on to further explain:

383 When you are in holding camps, there is a boredom factor, not only for the athlete,
384 but for the coach as well. We can actually get on each other's nerves, so you have to
385 find some way to entertain yourself and keep yourself occupied. So for me, I tend to
386 run a lot during holding camps and do training for myself and that helps burn off my
387 excessive nervous energy. Because you get just as nervous as the athlete, I don't care
388 who you are.

389 The psychological state of the coach could also be affected by the environment of
390 major events but the coach needed to maintain their composure. Coach E recognised being in
391 the holding camp or village during the taper had the potential to affect their coaching and
392 planning behaviours:

393 The environment where you train changes, the expectation of those around you
394 changes, and as a coach to the athlete, you are trying to keep things as they were, and
395 not change a thing. So it's at that point the coach has to become a damn good actor,
396 and hold their emotions within and let nothing out.

397 *Physical.* In this lower-order theme, coaches' explained the importance of 'work
398 done' leading into the taper and comprised three meaning units: preparation (e.g. the training
399 carried out leading into the taper), injury (e.g. working with an athlete who is injured, or has

400 been injured), and coach contact (e.g. the personal coach being at practice with the athlete
401 during the taper). Coaches all commented that one of the biggest challenges for coaches was
402 the preparation training, “work done”, leading into the taper. Coach G explained, “you can’t
403 taper from a taper.” This was in response to the challenge of preparing athletes for a major
404 competition, soon after the championship trials. However if there was a sufficient period
405 between the two events, Coach E explained, “If there is time and sufficient focus, we would
406 go back for a bit of volume before starting to taper down again.” The preparation training was
407 also affected by injuries. Coach G explained, “the only challenge I’ve come across is if the
408 athlete picks up an injury or something, because now you can’t actually deliver your taper.”

409 *External commitments.* In this lower-order theme, coaches’ responses explained that
410 external factors could have a negative impact on the effectiveness of the taper including
411 media (e.g. press commitments in the final days leading into the main competition), partner
412 (e.g. pressure from a significant other), and agents (e.g. commitments related to the athletes’
413 professional status). For example Coach E explained that, “if you work with a high profile
414 athlete at the championships there is often a lot of media interest, and that can drain their
415 central nervous system, and their emotions.”

416 *Developmental experiences*

417 This higher-order theme captured how coaches’ had learned to develop and improve
418 the taper process. This theme included the following lower-order themes: experiential
419 learning (e.g. trial and error and personal experience over the years), informal learning (e.g.
420 talking to other coaches, mentoring, talking to athletes), educational material (e.g. reading
421 books on planning, peaking, and tapering, developing knowledge of sciences). One of the
422 most frequently cited responses that helped coaches to develop their taper process was
423 learning through experience. Coach G explained that “over the years you change your
424 approaches and methods”, and that “you kind of have to experiment.” Coach A described

425 development as “trial and error, but more like trial and analysis rather than error. So it’s more
426 about evolution rather than revolution.” Other development sources included informal
427 learning opportunities through interactions with other coaches and athletes. For example,
428 Coach C emphasised that, “there are people that have made a big impact on how I’ve
429 developed, and those are the people that I’ve coached, the information I got back is from
430 those that I’ve coached.” Although Coach E commented, “certainly not through reading,
431 more from talking to [experienced coaches]”, other coaches valued educational materials to
432 develop a framework of the taper. Coach B explained that “you need to have knowledge and
433 understanding on planning and tapering, I work in a way, where you read about literature
434 tapering and stuff like that and you put that knowledge in place as a framework.”

435 **Discussion**

436 Much of our understanding of physiological processes, including tapering, comes
437 from laboratory experiments and does not reflect real-world high-performance competition
438 environments. Although there is research providing physiologically based guidance for the
439 content of the taper (e.g., Bompa & Haff, 2009; Mujika, 2009), the current study is the first to
440 examine coaches’ taper content and implementation process in preparation for performance
441 competitions. The purpose of the study was to examine Olympic and Paralympic coaches’
442 planning and implementation of the tapering process leading up to major competitions and
443 how they had learned to improve the process. Our findings suggest that tapering is far from
444 being a straight forward ‘textbook’ process restricted to physiological outcomes. Rather,
445 coaches took an integrated holistic approach involving the athlete in the planning process,
446 individualising the taper, considering the impact of technical input, and considering athletes’
447 psychological as well as physical state. When implementing the taper they continually
448 monitored its progress, involved the athlete, and adapted the taper further as required to
449 optimise competition performance.

450 The taper is a period of time when the amounts of training load are reduced before a
451 competition in an attempt to peak performance at a target time (Thomas & Busso, 2005).
452 When discussing the planned elements of the taper, the coaches in the present study shared
453 the view of (Houmard & Johns, 1994) who indicated that the length of taper should occur 7 to
454 21 days prior to a championship event. The strategies employed to achieve the desired
455 physiological adaptations of the taper were also consistent with research (e.g., Mujika, 2009).
456 The reduction of training load was primarily achieved through the reduction of training
457 volume, with coaches reducing the volume from 60% to 40%. Training intensity during this
458 phase was unchanged and kept to a high level, close to or at the competition intensity. Several
459 coaches explained that it was important to keep the training frequency the same, with some
460 coaches concerned about the risk of detraining if frequency and volume were both reduced. A
461 concern that is consistent with those found by Pyne, et al. (2009).

462 The training load of the taper described by the coaches in the current study was
463 largely consistent with research and 'textbooks' guidelines (e.g., Mujika, 2009), however, in
464 contrast to guidelines it was not restricted to physiological outcomes. The coaches adopted a
465 more integrated holistic approach. For example, the coaches involved the athletes in the
466 planning process, individualised the taper, considered the level of technical input they
467 provided, and integrated psychological preparation. Considering the athlete, current
468 circumstances, and involving the athletes in the planning process can foster autonomy
469 support and an environment where the planning process is a motivational tool which can
470 contribute to the athletes' performances in major competitions (Holiday, et al., 2008; Ritchie
471 & Allen, 2015). The coaches also considered a range of factors in order to individualise and
472 adapt the taper including the type of athlete, prior preparation, and the athlete's confidence
473 levels. The individualised approach is consistent with discussions of coaching, more
474 generally, which reinforces that not all athletes are the same, nor are circumstances and

475 contexts, and therefore a 'one size fits all' approach will not work for all athletes in all
476 situations (Amorose, 2007).

477 In addition to training load manipulation, coaches also identified that the level of
478 technical input provided by coaches was a critical consideration for the taper. Consistent with
479 recommendations (e.g., Yingbo, 1994), the coaches indicated that it was important not to add
480 new elements, as this would introduce uncertainty and unsettle the athlete's confidence at the
481 critical period. For the coaches in the present study, technical sessions during the taper were
482 about rehearsal and refinement, with coaches keeping the technical components basic,
483 working on the fundamentals of the event, and keeping the sessions simple. Our findings
484 support research with Olympic coaches and athletes who advocated keeping things simple,
485 not over-coaching, and limiting technical input in the immediate preparation prior to or
486 during competition (Gould, et al., 2001; 2002; Ritchie & Allen, 2015).

487 Further evidence of the coaches' integrated approach to tapering was the importance
488 coaches in the current study placed on psychological preparation. It was an integral part of
489 the tapering process and the coaches actively planned for and monitored it. This finding has
490 not been previously documented. The coaches recognised the importance of building (or
491 maintaining) athletes' confidence during the taper and this was a key consideration in
492 deciding the training content. They employed a range of strategies including the use of 'go to
493 sessions' that they knew the athletes enjoyed and providing a more collaborative approach,
494 whereby the athlete was empowered through being more involved in the design and
495 implementation of the taper. Confidence is a vital component of athletic performance (Hays,
496 Thomas, Maynard, & Bawden, 2009), and an athlete's confidence can be fragile in the
497 Olympic environment (Gould, et al., 1999). Therefore, actively planning for athletes'
498 psychological preparation during the taper, particularly around confidence, should be an
499 important consideration for coaches.

500 When discussing the implementation of the taper, the coaches described several
501 monitoring strategies, however, they relied largely on the use of observation of performance
502 and also of the athlete's psychological state. Through these subjective observations (Franks &
503 Miller, 1991), the coaches would analyse the athletes' behaviours and performance in training
504 against their own mental models for that athlete and event. Where, from an observer, the
505 coaches may appear to be 'off-task' and 'not coaching', in fact, the coaches were silently
506 observing the athlete. This information collection activity was important for the coaches to
507 enable them to adapt the training content during the tapering period, if it was needed.
508 Although being readily used in coaching, observations, which are fundamentally subjective in
509 nature (Hughes & Franks, 2008), do come with limitations due to the capacity to recount
510 information reliably and accurately (Franks & Miller, 1991). However, research has also
511 shown that when compared with novice coaches, experts' ability to recall visual patterns is
512 better, as long as the patterns are meaningful and domain specific, and that they place greater
513 emphasis on analysing situations (e.g., Randel, et al, 1996). In addition, research from a
514 professional judgement and decision making perspective (e.g., Abraham & Collins, 2011;
515 Collins, Collins, & Carson, 2016) would support the view that experienced coaches, such as
516 those in the current study, are capable of, and do use, sophisticated decision making
517 processes that employ intuitive and deliberative decision making enabling a check of the
518 validity and accuracy of a decision. To add to the information gained through observation, the
519 coaches also engaged the athletes in the process. They sought feedback from the athletes
520 which added to their observation and experience-based knowledge which informed on-going
521 decisions made about the taper. The coaches were comfortable with this collaborative process
522 when working with experienced athletes, however, they were more cautious with less
523 experienced athletes.

524 An important finding in relation to factors effecting the implementation of the taper
525 was coaches' awareness that confidence in their own ability was as vital for them as it was
526 for the athletes operating in world-class sports environments. For example, one coach noted
527 how the tapering process had failed due to the athlete's lack of confidence in him. Coaches
528 have cited a loss of confidence to be the effect of the stressors involved in world-class sports
529 coaching (Olusoga, Butt, Maynard & Hays, 2010, Olusoga et al., 2012) therefore, mental
530 preparation for coaches, themselves, is important so that they can be effective in their role
531 during the tapering process.

532 The planned content of the taper was based on knowledge of training principles,
533 previous experience of what worked and didn't work, and what the athlete preferred. A
534 number of coaches explained they had developed their taper through reading literature on
535 planning (e.g., Bompa, 1999; 2005; Bompa & Haff, 2009), peaking and tapering (e.g.,
536 Mujika, 2009), and sports training principles (e.g., Dick, 2002). The coaches, however, only
537 accessed these sources to gain a better understanding of the fundamentals of training
538 principles, planning and peaking and provided a base knowledge to start from. Once they
539 understood the basics, they developed more through their own coaching experiences of 'trial
540 and error' of previous tapers. Race (2005) described this as learning by doing, 'having a go',
541 experimenting, and practicing something. Race also identified learning by making mistakes,
542 by 'trial and error'. An important feature that enables coaches to learn from 'doing' is the
543 reflective practice (Schön, 1983). The coaches in the current study had and continued to exert
544 conscious effort toward examining the tapering process (content, implementation, and
545 challenges) and adjusted it to improve the athlete's performance during the tapering period
546 and in subsequent tapers.

547 Limitations and future directions

548 Our study provides valuable insight into the process of implementing the taper in the
549 lead up to a major competition, however, no study is without limitations. Due to the small
550 number of participants and contextualised nature of the study (i.e., coaches working in one
551 sport, track and field) it would be inappropriate to generalise the findings beyond this sample.
552 How coaches in different sports determine, implement, and develop further the tapering
553 process may not be the same as the coaches in our study. However, future research to further
554 our understanding of the implementation of the tapering process might examine the process
555 employed by female coaches as well as coaches working in different sports. For example,
556 how do coaches working in sports with important competitions each week or every few
557 months implement tapering principles? How do coaches working in team sports implement
558 and individualise the taper? Future research might also examine athletes' views on the
559 tapering process, their perceptions of the coaches' role and their own engagement in the
560 process with a view to considering what athletes' consider to be effective content and
561 implementation of the tapering process. Although the coaches in the current study did not
562 mention use of any tools other than observation for monitoring the tapering process, future
563 research could also explore coaches' perceptions and use of the various available monitoring
564 tools (e.g., questionnaires).

565 **Conclusion**

566 In the build up to major competitions, including during tapering periods, coaches need
567 to consider, plan for, and adapt to situations that can affect athletes' physiological adaptation
568 and mental processes leading to impaired performance (Marcora, Staiano, & Manning, 2009;
569 Van Cutsem et al., 2017). Whilst the disciplinary approach in the sports sciences means that
570 physical and psychological components are explored in isolation, based on the findings from
571 the current study, it is suggested that they should be integrated holistically into periodised
572 plans and taper strategies. The coaches in this study appeared to do so implicitly during the

573 tapering phase of training, and what they did could not be defined through any set of
574 formulaic rules (Kiely, 2012). Rather, they recognised the relationship between the body and
575 mind (Bailey, 2016) when attempting to optimise performance for a major competition.

576 The current study findings are important because these coaches' methods suggest that,
577 at least for them, the physiologically based taper theory (Bompa & Haff, 2009; Mujika &
578 Padilla, 2003) is not reflective of what happens in a real-world delivery context. In agreement
579 with Denison (2007) we do not suggest tapering theory should be disregarded. However, we
580 argue for a wider and more holistic conceptualisation of tapering, which not only draws from
581 theory but also from coaches' knowledge and experiences of what it takes to peak for a major
582 competition. The coaches in this study indicated that an effective taper allows an athlete's
583 confidence to grow, whilst allowing them to recover through a systematic reduction in
584 training load. Therefore, we suggest consideration of a more holistic approach to the taper is
585 required, in particular, physiological and psychological processes.

586 **References**

- 587
- 588 Amorose, A.J. (2007). Coaching effectiveness exploring the relationship between coaching
- 589 behaviour and self-determined motivation. In: Hagger, MS., Chatzisarantis, N.L.D.
- 590 (Eds.), *Intrinsic motivation and self-determination in exercise and sport*. Human
- 591 Kinetics, Champaign, IL, pp. 209-227.
- 592 Bailey, R. (2016). Sport, physical activity and educational achievement – towards an
- 593 explanatory model. *Sport in Society*, 437, 1–21. doi:10.1080/17430437.2016.1207756
- 594 Bompa, T.O. (1994). *Theory and methodology of training: the key to athletic training*.
- 595 Champaign, IL: Human Kinetics.
- 596 Bompa, T.O. (1999) *Periodisation, Theory and Methodology of Training*. Champaign, IL:
- 597 Human Kinetics.
- 598 Bompa, T.O. (2005) *Periodisation Training for Sports*. Champaign, IL: Human Kinetics.
- 599 Bompa T.O. & Haff, G. G. (2009) *Periodisation: Theory and Methodology of Training* (5th
- 600 Edition). Champaign, IL: Human Kinetics.
- 601 Bosch, F. and Klomp, R. (2001) *Running: Biomechanics and Exercise Physiology Applied in*
- 602 *Practice*. Elsevier. Churchill Livingstone.
- 603 Bosquet, L., Montpetit, J., Arvisais, D., & Mujika, I. (2007). Effects of tapering on
- 604 performance: A meta-analysis. *Medicine and Science in Sports and Exercise*, 39,
- 605 1358–1365. doi:10.1249/01.mss.0000273823.80848.1f
- 606 Cushion, C.J., Armour, K.M., Jones, R.L. (2006). Locating the coaching process in practice:
- 607 Models 'for' and 'of' coaching. *Physical Education and Sport Pedagogy*, 11, 83-99.
- 608 doi:10.1080/17408980500466995
- 609 Denison, J. (2007). Social Theory for Coaches: A foucauldian reading of one athlete's poor
- 610 performance. *International Journal of Sports Science and Coaching*, 2, 369-383.
- 611 doi:10.1260/174795407783359777

- 612 Dick, F.W. (2002) *Sports Training Principles* (4th Edition). London: A&C Black.
- 613 Faulkner, G., & Biddle, S. J. H. (2002). Mental health nursing and the promotion of physical
614 activity. *Journal of Psychiatric and Mental Health Nursing*, 9, 659–665.
615 doi:10.1046/j.1365-2850.2002.00520.x
- 616 Franks, I.M. & Miller, G. (1991): Training coaches to observe and remember, *Journal of*
617 *Sports Sciences*, 9:3, 285-297 doi:10.1080/02640419108729890
- 618 Gilbert, W., Cote', J., & Mallett, C. (2006). Developmental paths and activities of successful
619 sport coaches. *International Journal of Sports Science and Coaching*, 1, 69–76.
620 doi:10.1260/174795406776338526
- 621 Gould, D., Greenleaf, C., Dieffenbach, K., & McCann, S., (2001). Pursuing performance
622 excellence: Lessons learned from Olympic athletes and coaches. *Journal of*
623 *Excellence*, 4, 21-43.
624 http://www.zoneofexcellence.ca/Journal/Issue04/Pursuing_Perform_Excel.pdf
- 625 Gould, D., Guinan, D., Greenleaf, C., & Chung, Y. (2002). A survey of U.S. Olympic
626 coaches: Variables perceived to have influenced athlete performances and coach
627 effectiveness. *The Sport Psychologist*, 16, 229–250. doi: 10.1123/tsp.16.3.229
- 628 Gould, D., Guinan, D., Greenleaf, C., Medbery, R., & Peterson, K. (1999). Factors affecting
629 Olympic performance: Perceptions of athletes and coaches from more and less
630 successful teams. *The Sport Psychologist*, 13, 371-394. doi: 10.1123/tsp.13.4.371
- 631 Hays, K., Thomas, O., Maynard, I.W., & Bawden, M. (2009). The role of confidence in
632 world-class sport performance. *Journal of Sports Sciences*, 27, 1185–1199.
633 doi:10.1080/02640410903089798
- 634 Houmard, J. A., & Johns, R. A. (1994). Effects of taper on swim performance: Practical
635 implications. *Sports Medicine*, 17, 224– 232. doi:10.2165/00007256-199417040-
636 00003

- 637 Hughes, M. D., & Franks, I. M. (2008). *The Essentials of Performance Analysis - An*
638 Introduction. Routledge, London.
- 639 Jones, R. L., & Wallace, M. (2005). Another bad day at the training ground: Coping with the
640 ambiguity in the coaching context. *Sport, Education and Society, 10*, 119-134.
641 doi:10.1080/1357332052000308792
- 642 Kiely, J. (2012). Periodization paradigms in the 21st century: evidence-led or tradition-
643 driven? *International Journal of Sports Physiology and Performance, 7*(3), 242–250.
644 doi:10.1123/ijsp.7.3.242
- 645 Kraemer, W. J., & Bush, J. A. (1998). Factors affecting the acute neuromuscular responses to
646 resistance exercise. ACSM's resource manual: *Guidelines for exercise testing and*
647 *prescription* (pp. 164–181). Baltimore: Williams & Wilkins.
- 648 Lara-Bercial, S and Mallett, CJ (2016) *The Practices and Developmental Pathways of*
649 *Professional and Olympic Serial Winning Coaches. International Sport Coaching*
650 *Journal, 3* (3), 221-239. doi:10.1123/iscj.2016-0083
- 651 Lyle, J. (2002). *Sports coaching concepts: A framework for coaches' behaviour.*
- 652 Lyle, J. (2010). Planning for Team Sports, in Lyle, J. & Cushion, C. (2010). *Sports*
653 *Coaching: Professionalisation and Practice.* London: Elsevier. Chapter 6, pp 85-98.
- 654 Marcora, S. M., Staiano, W., & Manning, V. (2009). Mental fatigue impairs physical
655 performance in humans. *Journal of Applied Physiology, 106*(3), 857–864. doi:
656 10.1152/jappphysiol.91324.2008
- 657 Matveyev L.P. (1981) *Fundamentals of Sport Training.* Moscow: Progress Publishers.
- 658 McCormick, A., Meijen, C., & Marcora, S. (2015). Psychological Determinants of Whole-
659 Body Endurance Performance. *Sports Medicine, 45*(7), 997–1015.
660 doi:10.1007/s40279-015-0319-6

- 661 McKenna, J., & Mutrie, N. (2003). Emphasising quality in qualitative papers. *Journal of*
662 *Sports Sciences*, 21, 955–958. doi:10.1080/02640410310001641359
- 663 Mujika, I. (2009). *Tapering and peaking for optimal performance*. Human Kinetics.
- 664 Mujika, I. & Padilla, S. (2003). Scientific Bases for Pre-competition Tapering Strategies.
665 *Medicine & Science in Sports & Exercise*, 35, 1182-1187.
- 666 Mujika, I., Padilla, S., Pyne, D., & Busso, T. (2004). Physiological changes associated with
667 the pre-event taper in athletes. *Sports Medicine*, 34, 891 – 927.
668 doi:10.2165/00007256-200434130-00003
- 669 Olusoga, P., Butt, J., Maynard, I. & Hays, K. (2010): Stress and Coping: A Study of World
670 Class Coaches, *Journal of Applied Sport Psychology*, 22:3, 274-293.
671 doi:10.1080/10413201003760968
- 672 Olusoga, P., Maynard, I., Hays, K. & Butt, J. (2012): Coaching under pressure: A study of
673 Olympic coaches, *Journal of Sports Sciences*, 30:3, 229-239.
674 doi:10.1080/02640414.2011.639384
- 675 Patton, M.Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks,
676 CA: Sage.
- 677 Potrac, P., Jones, R. L., & Armour, K. (2002). ‘‘It’s all about getting respect’’: The coaching
678 behaviours of an expert English soccer coach. *Sport Education and Society*, 7, 183 –
679 202. doi: 10.1080/13573320309254
- 680 Pyne, D.B., Mujika, I. & Reilly, T. (2009): Peaking for optimal performance: Research
681 limitations and future directions, *Journal of Sports Sciences*, 27, 195-202.
682 doi:10.1080/02640410802509136
- 683 Race, P. (2005). *Making Learning Happen*. London: Sage.
- 684 Sanchez, M. L. A., Galbès, O., Fabre-Guery, F., Thomas, L., Douillard, A., Py, G., Busso, T.
685 & Candau, B. R., (2013): Modelling training response in elite female gymnasts and

- 686 optimal strategies of overload training and taper, *Journal of Sports Sciences*,
- 687 doi:10.1080/02640414.2013.786183
- 688 Thomas, L., & Busso, T. (2005). A theoretical study of taper characteristics to optimize
- 689 performance. *Medicine and Science in Sports and Exercise*, 37, 1615 – 1621. doi:
- 690 10.1249/01.mss.0000177461.94156.4b.
- 691 Thomas, L., Mujika, I. & Busso, T. (2008): A model study of optimal training reduction
- 692 during pre-event taper in elite swimmers, *Journal of Sports Sciences*, 26 643-652.
- 693 doi:10.1080/02640410701716782
- 694 Van Cutsem, J., Marcora, S., De Pauw, K., Bailey, S., Meeusen, R., & Roelands, B. (2017).
- 695 The effects of mental fatigue on physical performance: A systematic review. *Sports*
- 696 *Medicine*. doi:10.1007/s40279-016-0672-0
- 697 Wathen, D., & Roll, F. (1994). Training methods and modes. In T. R. Baechle (Ed.),
- 698 *Essentials of strength training and conditioning* (pp. 403–415). Champaign, IL:
- 699 Human Kinetics.
- 700 Weinberg, R., Butt, J., & Knight, B. (2001). High school coaches' perceptions of the process
- 701 of goal setting. *The Sport Psychologist*, 15, 20–47. doi:10.1123/tsp.15.1.20
- 702 Yingbo, Z. (1994). Pre-competition preparation for throwers. *New Studies in Athletics* 9, (1),
- 703 43-45. <https://www.iaaf.org/nsa/article/filter?&articleTitle=Pre-competition>
- 704 preparation for throwers&year=1994

705 Figure 1. Olympic track and field coaches' tapering practices leading up to major events.