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5 The tough get tougher': Psychological skills training with elite military recruits
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15 Citation:..
16 Fitzwater, J. P. J., Arthur, C. A., & Hardy, L. (2017). "The Tough Get Tougher": Mental
17 Skills Training With Elite Military Recruits. *Sport, Exercise, and Performance Psychology*.
18 Advance online publication.
19
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23 <https://doi.org/10.1037/spy0000101>
24

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26 Mental toughness has been described as one of the most important variables in determining

27 success in high stress environments (e.g., Gucciardi, Hanton, Gordon, Mallett, & Temby,

28 2015; Jones, Hanton, & Connaughton, 2002), with results from the mental toughness

29 literature supporting the contention that it is important in predicting performance outcomes

30 across various performance contexts (e.g., Arthur, Fitzwater, Hardy, Beattie, & Bell, 2015;

31 Beattie, Alqallaf, & Hardy, 2017; Bell, Hardy, & Beattie, 2013; Gucciardi, Hanton, et al.,

32 2015; Gucciardi, Peeling, Ducker, & Dawson, 2016). Yet there are limited field based

33 interventions that have been specifically designed to impact mental toughness and examine

34 the concomitant effects on performance, especially in military contexts. For exceptions within

35 sport please see Bell et al. (2013) and Gucciardi, Gordon, and Dimmock (2009). Indeed,

36 Gucciardi and colleagues have called for further research is to identify the most effective

37 content and method of delivery for psychological skills interventions aimed at

38 developing mental toughness. To this end the current research is a field based intervention

39 study that utilises objective performance data to examine whether a psychological skills

40 intervention facilitates an increase in mentally tough behaviour.

41 Despite the resurgence of research into mental toughness over the last 15 years,

42 spawning a plethora of definitions of mental toughness and a variety of tools by which to

43 measure it (e.g., Arthur et al., 2015; Clough, Earl, & Sewell, 2002; Gucciardi, Jackson,

44 Hanton, & Reid, 2015; Hardy et al., 2014; Middleton, Marsh, Martin, Richards, & Perry,

45 2005; Sheard, Golby, & v. Wersch, 2009), little progress has been made on the agreement of a

46 common conceptualisation and measurement tool (Gucciardi & Gordon, 2011). While mental

47 toughness has generally been regarded as a multidimensional, relatively stable, trait-like

48 construct (e.g., Clough et al., 2002; Gucciardi, Gordon, & Dimmock, 2009; Jones et al, 2002;

49 Clough & Crust, 2005), a collection of recent studies have provided evidence that it may be

50 appropriate to operationalize it as a unidimensional construct (e.g., Arthur et al., 2015; Hardy,
51 et al., 2014; Gucciardi, Jackson, et al., 2015; Gucciardi et al., 2016). Further, recent research
52 by Gucciardi, Hanton, et al. (2015) suggested that mental toughness may be “a contextualized
53 expression of dispositional traits that are activated or shaped by contextual or social factors”
54 (p. 41). In an attempt to further explore the underlying mechanisms of mental toughness,
55 recent attention has turned to observable behavior. (e.g., Beattie et al., 2017; Bell et al., 2013;
56 Gucciardi, Jackson et al., 2015; Gucciardi et al., 2016). Hardy et al. (2014) argue that while
57 several qualitative studies have shown that mental toughness may be related to a collection of
58 unobservable values, attitudes, emotions, and cognitions (e.g., determination, focus,
59 confidence, perceived control, thriving through challenge, sport awareness, tough attitude,
60 and desire for success) (e.g., Gucciardi & Gordon, 2011; Jones et al., 2002), mentally tough
61 *behavior* is just that, a behavior. Therefore, the presence or absence of mentally tough
62 behavior (e.g., persistence, effort, perseverance) should be determined before claims are made
63 about the importance of unobservable predictors and key correlates (Gucciardi, Jackson et al.,
64 2015; Hardy et al., 2014; Gucciardi et al., 2016). To this end we define mental toughness
65 from a behavioral perspective as “the ability to achieve personal goals in the face of pressure
66 from a wide range of different stressors” (Hardy et al., 2014, p. 5).

67 Although no common agreement exists on the precise definition of mental toughness,
68 researchers are in agreement that mental toughness is an important construct within
69 performance domains. Moreover, in most contexts where the ability to deal with adversity and
70 challenge is essential to success, mental toughness is commonly regarded as *the* most
71 important attribute that enables an individual to achieve high levels of personal performance
72 (e.g., Jones et al., 2002). Indeed, studies in a variety of achievement contexts have
73 demonstrated the importance of mental toughness. For example, when measured using the
74 Mental Toughness Questionnaire-48 (MTQ-48, Kaiseler, Poleman, & Nicholls (2009) showed

75 that mental toughness predicted coping and coping effectiveness and to be associated with
76 less stress and more control experienced by athletes. Further, Crust and Clough (2005)
77 demonstrated that mental toughness was significantly positively correlated to an endurance
78 task. In the military context, mental toughness has been shown to significantly predict higher
79 levels of performance over and above that accounted for by individual fitness levels (Arthur et
80 al., 2015) and normative commitment, affective commitment, and recruit adjustment in
81 training (Godlewski & Kline, 2012). Furthermore, Gucciardi, et al. (2015) provided evidence
82 that mental toughness was important for sustaining high levels of performance and success
83 when faced with the stress and adversity of a physically and mentally demanding military task
84 while controlling for hardiness and self-efficacy.

85 Despite the theoretical advances being made in mental toughness research, Gucciardi,
86 Hanton et al. (2015) argue that certain conceptual and methodological concerns have limited
87 the usefulness of previous studies for the conceptual development of mental toughness.
88 Firstly, the empirical focus on mental toughness has primarily been within sport contexts,
89 which limits the extent to which the construct may generalize to other, non-sport samples.
90 Secondly, when mental toughness *has* been examined in non-sport contexts, researchers have
91 applied sport models without an adequate explanation of the substantive or empirical evidence
92 for doing so (Gucciardi, Hanton, et al., 2015).

93 A number of researchers have contributed to the discussion regarding the theoretical,
94 empirical, and applied concepts in sport psychology and how they might be applied to current
95 and future military initiatives (e.g., DeWiggins, Hite, & Alston, 2010; Fiore and Salas, 2008,
96 Goodwin, 2008; Gucciardi et al., 2015; Hammermeister, et al., 2010; Janelle & Hatfield,
97 2008). Indeed, there are many similarities between the performance-related psychological
98 challenges that soldiers and athletes are required to deal with (Janelle & Hatfield, 2008). Both

99 lack predictability, with a real and perceived cost of winning and losing, and the associated
100 risk of participation impacting the psychological responses that affect performance
101 (DeWiggins et al., 2010). However, one could reasonably argue that the degree of risk and
102 objective magnitude of stressors experienced by combat soldiers is far greater than that of any
103 athlete or team, where terms such as “fighting for one’s life,” is often a realistic scenario
104 rather than a mere metaphorical descriptor (Janelle & Hatfield, 2008, p. S40). In many cases,
105 this repeated exposure to extreme stress often leads to adverse long-term emotional and
106 behavioral problems (Kok, Herrell, Thomas, & Hodge, 2012), with research showing these
107 effects to be significantly clustered in the cohort of personnel who start out less
108 psychologically robust (LeardMann, C. Smith, T. Smith, Wells, & Ryan, 2009).

109 Stress and anxiety in the military environment are not, however, limited to the combat
110 context. Problems of stress, coping and adaption are highly relevant in military training,
111 where distractions, anxiety and fear are common challenges experienced by recruits
112 throughout the training period, all of which require a degree of mental fortitude and/or various
113 coping strategies. Unfortunately, these important psychological competencies are, at best,
114 implicit, with recruits having to rely on their own cognitive functioning and coping strategies
115 to control thoughts, emotions, and behavior. Consequently, while many recruits learn these
116 vital mental lessons over time, the remainder will have varying degrees of difficulty acquiring
117 these skills (Thompson & McCreary, 2006). It is, therefore, logical to presume that the variety
118 of applied concepts in sport psychology, deemed so critical to high-level performance in
119 sports (i.e., mental toughness, psychological skills), could be utilized in military training to
120 enhance performance and facilitate coping in stressful situations (DeWiggins et al., 2010;
121 Fiore & Salas, 2008; Goodwin, 2008; Hammermeister, et al., 2010; Janelle & Hatfield, 2008).
122 In particular, elite military training and selection, which subjects potential candidates to far
123 more extreme physical and psychological demands in comparison to regular army units

124 (Sundin, Jones, Greenberg, Rona, Hotopf, Wessley, & Fear, 2010) may benefit from
125 performance enhancing concepts from the sport domain.

126 While the aforementioned research has only provided correlational evidence that
127 mental toughness is related to performance outcomes in the military, there is a dearth of
128 intervention research and thus there is as yet no evidence to suggest that mental toughness can
129 be developed within a military context. Furthermore, no intervention evidence exists that
130 increasing levels of mental toughness will have concomitant effects on performance.

131 Therefore, in light of the environmental stresses experienced by servicemen and women,
132 along with the potential emotional and behavioral problems, the next logical step would be to
133 explore the possibility of developing mental toughness in military personnel through targeted
134 interventions. The current research utilised a field based intervention design to examine the
135 development of mental toughness in a high performance military training context.

136 The United States military has already acknowledged the potential value of
137 theoretical, empirical, and applied concepts from sport psychology. In an effort to increase the
138 psychological strength and positive performance of its service personnel, and reduce the high
139 incidence of maladaptive responses of combat-related stress disorders, the U.S Army has
140 established the comprehensive soldier fitness (CSF) program and the mental resilience trainer
141 (MRT) course as a means of delivery. CSF is an integrated, proactive approach to increasing
142 resilience and enabling mental toughness in soldiers, their families, and the civilian
143 workforce. Personnel are taught a variety of performance enhancing psychological and
144 physical skills to be employed when facing a wide variety of challenges they may be
145 required to face in their personal and professional lives, including combat (see Reivich,
146 Seligman, & McBride, 2011 for a review). The MRT course is one of the foundational pillars
147 of comprehensive soldier fitness and provides instruction to low-level unit leaders on how to
148 teach the resilience and mental toughness enabling skills to their soldiers (see Cornum,

149 Mathews, & Seligman, 2011 for a review). Furthermore, psychological skills training (PST)
150 has been integrated into elite U.S. Special Forces training and selection to facilitate the
151 development of mental toughness. During the U.S. Navy SEAL Basic Underwater
152 Demolition/Seals program, potential candidates receive training in a variety of psychological
153 skills and cognitive strategies that are integrated throughout the SEAL selection program.
154 (e.g., Robson & Manacapilli, 2014). Unfortunately, however, no empirical evidence exists to
155 suggest that this develops mental toughness or resilience in SEAL candidates.

156 Several decades of research in the sport domain has generated a wealth of evidence
157 demonstrating the positive effect of psychological skills usage in relation to performance
158 (e.g., Cumming & Ramsey, 2010; Hanton, Mellalieu & Hall, 2004; Kress & Statler, 2007;
159 Patrick & Hrycaiko, 1998; Sheard & Golby, 2006; Thelwell et al., 2001). However, only in
160 the past decade have there been attempts in sport to enhance mental toughness via PST
161 interventions in sport (e.g., Bell et al., 2013; Gucciardi et al., 2009), therefore, it would seem
162 prudent to adopt a PST perspective within a military context. This is surprising, considering
163 that many of the factors associated with mental toughness (e.g., Connaughton, Hanton, &
164 Jones, 2010; Jones et al., 2002) have been shown to be associated with psychological skills
165 (e.g., confidence, emotional control, visualisation motivation, positive energy, commitment,
166 thrive through challenge, etc.) (Beattie et al., 2017). While no attempt has been made to
167 conduct PST intervention studies to facilitate the development of mental toughness in the
168 military, there have been recent PST studies aimed at enhancing performance, with the initial
169 results being widely supportive of the benefits of psychological skills (e.g., Adler, Bliese,
170 Pickering et al., 2015; R. Arthur, Fitzwater, Roberts, Hardy, & C. Arthur, 2017;
171 Hammermeister et al., 2010).

172 For example, Adler and colleagues examined the effect of a psychological skills
173 intervention with a sample of soldiers in basic combat training. Results revealed that soldiers

174 using a variety of task-related psychological skills (including goal-setting, relaxation
175 techniques, self-talk and mental rehearsal) performed significantly better on a variety of
176 military tasks (including fitness related tasks), compared to those in an active control
177 condition. Hammermeister and colleagues examined soldier's use of psychological skills in
178 three psychological skills profile groups (i.e., strong skills, weak skills, and fearful focus).
179 Results revealed that soldiers in the strong psychological skill profile group performed
180 significantly better than those in the other profile groups on an army physical fitness
181 assessment. More recently, R. Arthur and colleagues examined the indirect effects of basic
182 psychological skills (i.e., goal-setting, relaxation, self-talk, & imagery/mental rehearsal) on
183 military endurance through enhanced advanced psychological skills. While controlling for
184 fitness as a covariate, their results revealed that goal-setting, imagery and relaxation all had
185 positive indirect effects on endurance via activation, with goal setting also impacting on
186 endurance via negative thinking. This provides further support for the use of basic
187 psychological skills for enhancing performance in a military context.

188 Unfortunately, no attempt was made to measure mental toughness in any of these
189 studies, thus the role of PST in developing mental toughness and the concomitant effects on
190 performance remains untested. This is unfortunate, as the military training environment is
191 replete with opportunities for the recruits to demonstrate mentally tough behavior.
192 Consequently, the current study aims to extend the work these studies by examining the
193 potential impact of a psychological skills intervention on the development of mental
194 toughness in an elite military training setting towards the end of the training period. A
195 secondary aim is to examine the impact of the intervention on performance.

196 While individual talent (including physical fitness) is an important variable in
197 performance achievement, it is not uncommon for talented individuals with exceptional
198 physical attributes to fail to perform to their full potential. Indeed, it is recognized that

199 psychological factors are just as important in determining athletic performance, with mental
200 toughness being acknowledged one of *the* most important attributes in achieving performance
201 excellence, particularly in contexts where the ability to deal with adversity and challenge is
202 essential to success (Gucciardi et al., 2008; Jones et al., 2002). Furthermore, previous
203 research in both elite and regular military training environments have shown transformational
204 leadership to positively impact on a number of performance-related outcome variables (e.g.,
205 resilience, confidence, training satisfaction, group cohesion) and discriminate between
206 recruits' success and failure in training (Arthur & Hardy, 2014; Hardy et al., 2010).
207 Consequently, the current research controlled for leadership and physical fitness.

208 The current study used a quasi-experimental trial with experimental (PST) and control
209 conditions to examine the impact of a psychological skills intervention on observer-rated
210 mental toughness and performance on an arduous military selection course. The
211 psychological skills intervention targeted the four basic psychological skills of goal-setting,
212 relaxation and arousal regulation, self-talk strategies and imagery/mental rehearsal, based on
213 their previously demonstrated efficacy with respect to performance enhancement in
214 competitive sport and military contexts (e.g., Arthur, et al., 2015; Kress & Statler, 2003;
215 Patrick & Hryaiko, 1998; Sheard & Golby, 2006; Thelwell et al., 2001). P-Company provided
216 all participants with the same opportunity to demonstrate mentally tough behavior under
217 pressure, with prior individual fitness and the recruits' leadership climate being isolated as
218 covariates. In this way the current research addresses the potential impact on the recruits'
219 performance by the previously mentioned extraneous variables. We hypothesize that: (a) PST
220 will result in an increased use of psychological skills during training resulting in, (b) greater
221 use of psychological skills use by recruits during an arduous physical selection course and, (c)
222 greater use of psychological skills will result in higher levels of mental toughness with
223 concomitant effects on performance.

224

Method225 **Participants**

226 Data was collected from 222 male British Army Para recruits, aged between 17 and 33
227 ($M_{age} = 21.13$, $SD = 3.36$) and 32 Parachute Regiment corporals ($M_{age} = 28.44$, $SD = 2.74$) from a
228 UK-based infantry training establishment. At the start of the study, the recruits were at week
229 16 of basic training, having had no previous military experience, while the corporals were part
230 way through a 24-month instructional tour of duty ($M = 12.80$ months, $SD = 6.51$ months)
231 and had served between 7 and 18 years in the Parachute Regiment ($M = 9.78$ years, $SD =$
232 1.90 years).

233 **Para Training and Selection**

234 Para basic training is a 28-week course, widely regarded by the British Army as being
235 the most physically and mentally demanding of all infantry regiments in the British Armed
236 Forces (Wilkinson, Rayson, & Bilzon, 2008). It is designed to produce physically and
237 mentally robust soldiers able to deal with the physical and mental demands placed on soldiers
238 in combat. Due to the highly attritional nature of Para basic training, platoon sizes can
239 decrease by up to 60% before completion (Wilkinson et al., 2008). Failure to complete the
240 course is attributable to a variety of reasons, including injury, poor performance, or voluntary
241 discharge.

242 At week 20 of the course, Para recruits are required to undergo Pre-Para Selection, more
243 colloquially known as P-Company. The purpose of P-Company is to test physical fitness,
244 determination and mental robustness, under conditions of stress, to determine a recruit's
245 suitability for service in the Parachute Regiment. Although a high level of fitness is required
246 to successfully complete P-Company, the various tests are also designed to assess a recruit's
247 ability to maintain a high level of performance under pressure. Failure results in the
248 unsuccessful recruits being reallocated to a platoon earlier in the training cycle or transfer to

249 another infantry regiment. P-Company consists of a series of physically demanding team and
250 individual events that involve carrying personal equipment weighing 20kg or more for
251 distances of up to 32km over severe terrain with time constraints, a steeplechase assault
252 course, and an aerial confidence course. Two team events require the participants to run with
253 a 60kg log and 80kg stretcher for 2.5km and 8km respectively. P-Company pass rates
254 typically range between ~40-70%.

255 **Statistical Power**

256 Statistical power for the current study was estimated using G*Power3 (Faul,
257 Erdfelder, Lang, & Buchner, 2007) using the generally accepted criteria of .80 or above to
258 detect an effect (Cohen, 1988). The G*Power analysis revealed that a power of .80 would be
259 achieved with a sample size of between 28 and 237, depending on the analysis (i.e., mixed
260 model MANOVA, $N = 237$; 1-way MANOVA, $N = 86$; mixed model ANOVA, $N = 28$;
261 ANCOVA, $N = 128$).

262 **Study Design**

263 A random block experimental design was implemented to evaluate the efficacy of the
264 intervention. While completely random allocation of participants is preferred, this was not
265 feasible at the recruit level in the present study because it would have meant delivering the
266 PST to some recruits in each platoon and not others. This was not possible because the
267 structure of training precluded this. Furthermore, this design would likely compromise the
268 integrity of the groups, as cross contamination would be highly possible. When random
269 assignment is not possible, Grant and Wall (2009) suggest a quasi-experimental design to be
270 appropriate. Quasi-experimental designs have distinct advantages in that they can serve to
271 strengthen causal inferences, minimize ethical dilemmas and inequity, and help the researcher
272 to take advantage of the effect of un-controllable environmental events.

273 Data were gathered at 2 time points, 3 weeks (22 days) apart. The first platoon was
274 assigned to the control condition, the second to the experimental, and so on for a total of 10
275 platoons (five in each condition). By the later stages of training, a typical Para platoon
276 consists of, not only those remaining of the original intake, but also those returning from
277 injury and rehabilitation, those who have failed an earlier P-Company or stage of training and
278 transferees from other regiments. Consequently, some control recruits had already been
279 exposed to some form of coping skills training by the first author, while others who had
280 transferred would have already completed basic training with their own regiments. Therefore,
281 in order to avoid any influence from recruits previously exposed to PST or other confounding
282 variables, the inclusion criteria for the study was that only original entrants in each platoon
283 were eligible to participate. Thus, questionnaires were only administered to, and data
284 collected from, recruits who had started with the original intake of each platoon and had
285 completed 16 weeks of training at the start of the study. Of the 222 recruits from whom initial
286 data were collected, 83.8% ($n = 186$) completed P-Company and, therefore, were retained for
287 analysis ($n_{control} = 92$; $M_{age} = 20.96$, $SD 3.54$; $n_{experimental} = 94$; $M_{age} = 21.14$, $SD 3.20$). The
288 remainder were either: (1) not loaded onto P-Company due to injury (13.9%, $n_{control} = 16$,
289 $n_{experimental} = 4$) or being back-termed to a previous platoon (9.7%, $n_{control} = 7$, $n_{experimental} = 4$);
290 (2) withdrawn during P-Company due to injury (7%, $n_{control} = 6$, $n_{experimental} = 2$); or (3)
291 withdrawn from P-Company due to failure to complete the aerial assault course (0.8%, $n_{control}$
292 = 1, $n_{experimental} = 1$). The aerial assault course is the second event of P-Company and is a pass
293 or fail test with no points allocated. Failure to successfully complete this test results in
294 withdrawal from P-Company.

295 **Instruments**

296 **Military Training Mental Toughness Inventory.** The Military Training Mental
297 Toughness Inventory (MTMTI; Arthur, et al., 2015) is a six-item informant rated behavioral

298 measure of mental toughness designed to assess recruits' ability to maintain optimal
299 performance under pressure from a range of different stressors experienced during infantry
300 basic training. Responses are based on how well each recruit is able to maintain a high level
301 of personal performance when confronted with different stressful situations in training (e.g.,
302 when the conditions are difficult; when he has been reprimanded or punished). Responses are
303 based on a 7-point Likert scale ranging from 1 (never) to 7 (always), with a midpoint anchor
304 of 4 (sometimes). The MTMTI has been found to possess sound psychometric properties and
305 structural validity as well as good test-retest reliability, concurrent validity, and predicted
306 performance in two different training contexts with two separate samples, including a sample
307 of Para recruits (Arthur et al., 2015). The composite reliability for the scale was .93, with
308 standardized factor loadings ranging from .76 to .97.

309 **Test of Performance Strategies.** The Test of Performance Strategies (TOPS-2; Hardy,
310 Roberts, Thomas, & Murphy, 2010) is a 36-item instrument designed to measure a range of
311 basic and advanced psychological skills and techniques used by athletes in both practice and
312 competition. Specifically, the instrument measures the quantity of use rather than the quality
313 of use (i.e., how much one uses the skills/techniques, rather than how good or effective one is
314 at implementing them). A previously contextually modified version of the TOPS-2, which
315 was shown to demonstrate good psychometric properties with a similar sample population
316 (Arthur et al., 2017), was used to assess recruits' use of psychological skills in training (i.e.,
317 pre and post-intervention) and during P-Company. In the current research we only used the
318 four basic psychological skills subscales that assess the extent to which recruits make use of
319 psychological skills. Example items included; "I set realistic but challenging goals for
320 practice" (goal-setting), "I use relaxation techniques as a coping strategy during P-Company"
321 (relaxation), "I say things to myself to help my practice performance" (self-talk) and, "I
322 rehearse my performance in my mind before practice" (imagery). The composite reliability

323 for the practice scale was .97, with standardized factor loadings ranging from .76 to .97. The
324 composite reliability of the competition scale was .95, with standardized factor loadings
325 ranging from .45 to .94. Only four were below .70, one in each subscale.

326 **Transformational Leadership Inventory.** A modified version of the Differentiated
327 Transformational Leadership Inventory (e.g., DTLI; Hardy, Arthur, Jones et al., 2010) was
328 used to measure and control for leadership climate within each group. The DTLI has 22-
329 items that measure the following 6 transformational leadership behaviors: (a) appropriate role
330 modeling (e.g., "my section corporal always leads by example"); (b) inspirational motivation
331 (e.g., "..... sets high standards for me to achieve"); (c) fostering acceptance of group goals
332 (e.g., "..... always encourages us to be team players"); (d) individual consideration (e.g.,
333 ".....spends time teaching and coaching me"); (e) intellectual stimulation (e.g.,
334encourages me to think for myself"); and (f) high performance expectations (e.g.,
335 ".....always emphasizes trying your best"). Responses were made on a 5-point Likert scale
336 anchored by 1 (not at all), 2 (not very often), 3 (sometimes), 4 (fairly often) and 5 (all of the
337 time). The purpose of measuring transformational leadership in the current study was simply
338 to control for the effects of transformational leadership. Consequently, it was decided to form
339 a composite transformational leadership scale by using one item from each subscale. This
340 procedure has been used in other research on transformational leadership where a composite
341 reduced item scale has been used (e.g., Barling, Loughlin and Kelloway, 2002). Individual
342 items were selected based on those we considered most representative of the sub-scale. The
343 items selected are those provided as example items above. The composite reliability for the
344 composite leadership scale was .87, with standardized factor loadings ranging from .64 to .78.

345 **Performance.** During P-Company, recruits can achieve a maximum of 70 points,
346 determined by their performance on each event (i.e., up to 10 points for each of the 7 events;
347 the aerial confidence course is a pass or fail test). Most of the points are awarded objectively

348 based on time to complete or completion of an event and are awarded by P-Company staff,
349 who are independent of the recruits' regular training team. Performance scores during the
350 present study ranged from 10-70 out of a maximum possible score of 70 points ($M = 55.53$,
351 $SD = 11.01$), which is within the normal range for P-Company.

352 **Fitness.** An objective measure of fitness was used to control for individual fitness. At
353 week 16, recruits are required to complete two contextually relevant, timed physical
354 assessments to measure progression in individual fitness. One of these assessments is a two-
355 mile loaded run, carrying a 16 kg pack and 4kg rifle, with the other being the negotiation of a
356 steeplechase assault course consisting of several dry and water obstacles. The two-mile
357 loaded run times ranged from 15min, 4s to 25min, 3s ($M = 18min, 31s$, $SD = 1min, 51s$),
358 while the steeplechase times ranged from 17m:16s to 29 min, 28s ($M = 20m:50s$, $SD =$
359 1m:42s). In order to create an overall indication of individual fitness prior to the delivery of
360 the intervention, the times were standardized for each event and were then combined to create
361 an overall score. The overall score was then multiplied by -1 (so that a higher score was
362 indicative of better performance).

363 **Procedure**

364 Following institutional ethical approval, at week 16 of training, the recruits and
365 instructors were informed of the nature of the study and asked if they would participate.
366 Those agreeing to participate were given standardized verbal instructions regarding the
367 completion of the initial questionnaires, including social-desirability instructions which
368 encouraged participants to respond honestly at all times. All participants were also informed
369 that the data provided would be held in confidence and not shared with any third party (e.g.,
370 their instructors, PPS staff) and that they were free to withdraw from the study at any time.

371 The TOPS-2 (practice) and DTLI were both administered to recruits in week 16 prior to
372 the intervention being delivered (T1), and at the beginning of week 20, two days prior to the

373 start of P-Company (T2), and by which time the intervention had been completed. The TOPS-
374 2 (competition) was administered to the recruits with a retrospective instructional set within
375 one hour of completing the final P-Company event and before they had been informed of the
376 results. The recruit questionnaires were administered in a large recreation room by the first
377 author with no other military staff present. The MTMTI were administered at weeks 16 and
378 20 in the instructors' rest room. Fitness data were collected at weeks 16 and 19 and P-
379 Company performance data were obtained on completion of P-Company from the official P-
380 Company scorecard.

381 **Intervention**

382 The experimental group was exposed to a psychological skills program targeting goal-
383 setting, relaxation and arousal regulation, self-talk strategies and imagery/mental rehearsal.
384 The intervention was developed and administered by the first author (a former warrant officer
385 in the Parachute Regiment, and a performance psychology doctoral student under the
386 guidance of two scientists with doctoral-level sport psychology expertise) following general
387 guidelines recommended by Weinberg and Williams (2010). The intervention consisted of a
388 total of 520 minutes of interaction with the first author, split into two 80 minute and seven 40
389 minute sessions between the start of week 17 and the end of week 19. All of the sessions
390 were classroom based, with the exception of one outdoor practical session. After consultation
391 with the organizational hierarchy and training staff, the training sessions were integrated into
392 the platoon's training schedule where they would cause minimum disruption to the training
393 program.

394 **Intervention Procedure**

395 After an initial introductory and administrative session, the first skill session involved
396 the recruits being educated in the use of progressive muscle relaxation (Hardy et al., 1996;

397 Williams, 2011) and a simple breathing exercise (rhythmic breathing; Williams, 2010) to
398 modify their arousal levels prior to, and during P-Company events. During the second skills
399 session, goal-setting and the use of effective goal-setting strategies were taught, with recruits
400 being encouraged to identify personal outcome, performance and process goals (e.g.,
401 complete 10 miler, score more than 50 points on P-Company, regulate breathing and relax
402 during the log race). Having been previously encouraged to identify negative self-talk
403 statements during PT sessions, the third skills session involved educating the recruits in
404 techniques for controlling personal self-talk dialogues, including, thought-stopping, reframing
405 and countering. Examples from the recruits' own experiences were discussed and how they
406 could be changed to a positive valence. The fourth skills session involved recruits being
407 educated in imagery use. An imagery exercise was conducted during which they were
408 encouraged to incorporate all their senses into the experience. It was also explained to them
409 how to conduct mental rehearsal utilizing the other three skills. Sessions were highly
410 interactive and during each session, the potential utility of each skill, before and during P-
411 Company events, was discussed. The recruits were also encouraged to practice each skill
412 during their scheduled physical training sessions. Once taught the four basic skills, a practical
413 psychological skills session was conducted to provide the recruits with opportunity to practice
414 the skills under supervision on a simulated P-Company event (i.e., the log race). This event
415 was chosen as, administratively and time-wise, it had no disruptive effect on the recruits'
416 training. It is also perceived to be one of the hardest P-Company events, involving many
417 aspects of fitness (i.e., endurance, strength, stamina) as well as the ability to tolerate athletic
418 pain (i.e., a great degree of physical discomfort). As each skill was taught, the recruits were
419 encouraged to practice them during their scheduled physical training events, so that they
420 could be reviewed and discussed in subsequent sessions. Details of the content of each session
421 of the intervention can be obtained from the first author.

422 **Comparison Control Group**

423 The control group was not exposed to any form of PST, while both groups
424 experienced the same training regimen throughout the course. The only contact by the
425 research team with the control condition was by the first author, which was solely for the
426 administration of questionnaires. Participants were not informed of the study hypotheses.

427 **Analytic Strategy**

428 The aim of the analysis was fourfold; (1) to determine whether Para recruits' use of
429 psychological skills was greater in training after receiving a PST program, (2) to examine
430 whether there were any differences between the two groups in the recruits' use of
431 psychological skills during P-Company (i.e., "competition"), (3) to examine whether there
432 was a significant increase in mentally tough behavior in the experimental group as a result of
433 receiving a PST program and, (4) to identify whether there was any significant differences in
434 individual performance between groups during P-Company. The primary data analysis was
435 conducted using IBM SPSS Statistics for Macintosh, Version 22.0 (IBM Corp, 2013).

436 Descriptive data for study outcome variables and covariates are displayed in Table 1.
437 Four analyses were conducted: (1) With the four basic psychological skills entered as the
438 dependent variables, a 2 (Group) x 2 (Time) mixed model MANOVA was conducted to
439 examine the effect of the PST program on psychological skills usage during training (i.e.,
440 practice); (2) With the four basic psychological skills entered as the dependent variables, a
441 one-way MANOVA was conducted to determine group differences in psychological skills
442 usage during P-Company test week (competition); (3) A 2 (Group) x 2 (Time) mixed model
443 ANOVA was conducted to determine whether there were significant changes in instructor-
444 rated mental toughness between the two conditions between pre- and post-intervention with
445 mental toughness as the dependent variable; and (4) With the individual P-Company scores of

446 the recruits entered as the dependent variable and individual fitness rating and the composite
447 transformational leadership scale at week 16 entered as covariates a one-way ANCOVA was
448 conducted to examine the difference in individual performance between groups on P-
449 Company. Finally, a Chi square analysis was conducted to determine any significant
450 difference in pass rates between the groups.

451 **Results**

452 **Preliminary Data Testing**

453 MANOVA is known to be extremely sensitive to outliers, which may produce either a
454 Type I, or Type II error with no indication as to which has been committed (Tabachnick &
455 Fidell, 2013). Consequently, preliminary testing revealed 13 univariate outliers which were
456 subsequently removed prior to further analyses, thereby reducing N from 186 to 173 ($M_{age} =$
457 21.03, SD 3.34 ($n_{control} = 90$; $M_{age} = 21.07$, SD 3.20; $n_{experimental} = 83$; $M_{age} = 21.00$, SD 3.51)).
458 However, while there is no unequivocal procedure for dealing with outliers, in the interests of
459 transparency, the results for all analyses with the outliers retained can be viewed in the
460 supplementary material.

461 All other assumptions were met, with the exception of Box's M statistic revealed a
462 violation in the assumption of variance-covariance matrices for the psychological skills
463 variables ($p = < 001$) and Levene's test, which demonstrated a violation in homogeneity of
464 variance for some of the psychological skills ($p = < .05$). However, Box's M test is known
465 to be over sensitive with large and relatively equal group sizes and that MANOVA is robust
466 enough to deal with this violation (Tabachnick & Fidell, 2013), therefore, a manual scan of
467 the SPSS output was conducted which revealed satisfactory QQ plots. Moreover, in line with
468 recommendations by Tabachnick and Fidell (2013), a more conservative alpha level of .025
469 was set in order to avoid the possibility of a Type 1 error. Independent sample t -tests were
470 conducted to determine any differences in leadership climate (composite transformational

471 leadership score) and individual fitness levels. While there were no significant differences in
472 leadership climate at week 16 ($t(166) = .105, p = > .05$), mean fitness in the experimental
473 group was significantly higher than in the control group at week 16 ($t(166) = -4.84, p = <$
474 .01). Individual fitness and the composite transformational leadership scores were treated as a
475 covariates when analysing P-Company performance.

476 Attrition bias analyses were conducted to determine any differences between
477 participants who completed P-Company ($n_{complete} = 173$) and those who did not ($n_{non-complete} =$
478 36). The results revealed no significant differences between the groups for any of the study
479 variables: (a) psychological skills ($F(4,195) = 2.34, p = >.05$); (b) mental Toughness ($t(198) =$
480 1.64, $p = >.05$); (c) individual fitness ($t(194) = .689, p = >.05$); (d) composite leadership:
481 ($t(200) = .744, p = >.05$).

482 **Main Data Analysis**

483 **Psychological skills during training.** A 2 (group) x 2 (time) mixed model MANOVA
484 revealed a significant group x time interaction ($F(4, 168) = 10.56, p = < .01, \eta^2_p = .20$).
485 Univariate follow up tests revealed significant group x time interactions in the use of goal-
486 setting ($F(1, 171) = 17.50, p = < .01, \eta^2_p = .09$), relaxation ($F(1, 171) = 25.38, p = < .01, \eta^2_p$
487 = .13), self-talk ($F(1, 171) = 16.02, p = < .01, \eta^2_p = .09$), and imagery ($F(1, 171) = 5.14, p =$
488 $< .02, \eta^2_p = .03$).

489 Eight Bonferroni corrected paired sample t -tests (.05/8 = .006) revealed that goal-
490 setting ($t(89) = -.83, p = > .05$), relaxation ($t(89) = .74, p = > .05$), self-talk ($t(89) = -.63, p = >$
491 .05), and imagery ($t(89) = -.89, p = > .05$) in the control group did not differ from pre-test to
492 post-test, while significant differences were evidenced in the scores for goal-setting ($t(82) = -$
493 6.53, $p = < .001$), relaxation ($t(82) = -5.90, p = < .001$), self-talk ($t(82) = -4.63, p = < .001$),
494 and imagery ($t(82) = -3.94, p = < .001$) in the experimental group. This indicates that the
495 interactions were likely caused by an increase in the use of all four psychological skills during

496 training by the experimental group between pre and post-test, while no differences were
497 evidenced in the control group.

498 **Psychological skills during P-Company.** A one-way MANOVA revealed a
499 significant multivariate effect for group in the use of psychological skills during P-Company
500 ($F(4, 168) = 3.55, p = < .01, \eta^2_p = .08$). Univariate follow-up tests revealed significant group
501 effects in the use of relaxation ($F(1, 171) = 12.59, p = < .01, \eta^2_p = .07$) and imagery ($F(1,$
502 $171) = 4.85, p = < .05, \eta^2_p = .03$), while no main effect was observed with goal-setting ($F(1,$
503 $171) = 2.77, p = > .05, \eta^2_p = .02$) and self-talk ($F(1, 171) = 2.88, p = > .05, \eta^2_p = .02$).

504 Examination of the cell means indicated that all these effects were due to the experimental
505 group making more use of psychological skills during P-Company than the control group.

506 **Mental Toughness.** A 2 (group) x 2 (time) mixed-model ANOVA revealed a
507 significant group x time interaction ($F(1, 171) = 5.30, p = < .05, \eta^2_p = .03$).

508 Four Bonferroni corrected paired sample *t*-tests ($.05/4 = .0125$) revealed that mental
509 toughness scores for the control group ($t(89) = 1.08, p = > .05$) and the experimental group
510 ($t(82) = -2.11, p = .038$) did not differ from pre-test to post-test.

511 An independent sample *t*-test revealed no significant difference between the two
512 groups at pretest ($t(171) = -1.25, p = > .05$) and a significant difference at post-test ($t(171) = -$
513 $3.16, p = < .01$), indicating that the interaction was caused by an increase in mental toughness
514 in the experimental group between pre and posttest, with no change having occurred in the
515 control group.

516 **P-Company Performance.** A one-way ANCOVA, with individual fitness prior to P-
517 Company and leadership climate entered as covariates, revealed that individual performance
518 on P-Company was significantly higher in the experimental group than the control group (F
519 ($1, 172) = 5.93, p = < .05, \eta^2_p = .03$). Although there was a difference of 4.8% in pass P-

520 Company rates (Exp = 91.6%; Cont = 85.6%), a Chi squared test indicated that this was non-
521 significant ($\chi^2(1) = .11, p = > .05$).

522 **Discussion**

523 The purpose of this study was to examine whether a PST intervention would facilitate
524 the development of mental toughness, thereby, enhancing the performance of elite British
525 Army recruits undergoing a physically and mentally demanding infantry regiment selection
526 course. We hypothesized that basic psychological skills usage in the experimental group
527 would significantly increase during training and during a week-long physically and mentally
528 demanding selection course (i.e., P-Company) with concomitant effects observed in informant
529 rated mental toughness and performance when compared to the control group. Importantly,
530 the current study examined the relationships whilst controlling for fitness and leadership
531 climate. This is first study to have examined such effects using an informant-rated measure
532 of mental toughness along with an objective measure of performance in a military context.

533 Results revealed general support for the hypotheses. As a consequence of the 3-week
534 intervention, the experimental group engaged in a significantly greater use of goal-setting,
535 relaxation techniques, self-talk strategies and imagery/mental rehearsal in training than the
536 control group, there was a significant increase in observer-rated mental toughness in the
537 experimental group between pre and post-test, whilst there was no change in mental
538 toughness in the control group. Moreover, individual performance was significantly higher in
539 the experimental group during P-Company when controlling for fitness and leadership climate
540 in training. However, significant differences in psychological skills usage during P-Company
541 were only evidenced with relaxation and imagery, whereas no differences were evidenced in
542 the use of goal-setting and self-talk. Lastly, whilst the experiential group had higher overall
543 pass rates during P-Company, the difference was not significant.

544 An interesting and unanticipated result that emerged from the current research was the
545 difference for the intervention effects on psychological skill usage during training and during
546 P-Company. Specifically, use of all the psychological skills was impacted during training
547 whilst only relaxation and imagery were impacted during P-Company. It is unclear why
548 exactly this was the case, however, a closer examination of the nature of the psychological
549 skills, the nature of the P-Company assessment, and the environment in which the research
550 was conducted may provide some possible explanations. On P-Company, the control recruits
551 reported using the same levels of self-talk and goal setting, yet they had not received any
552 training in the use of these skills. A possible explanation is that goal setting and self-talk may
553 be more naturally occurring psychological strategies than relaxation and imagery. Due to the
554 consequences of failing P-Company, optimal performance on every event is arguably more
555 important and, therefore, stressful than training. Indeed, previous research has shown athletes
556 to engage in greater use of psychological skills during competition than in practice because
557 athletes view competition as more important than practice (e.g., Frey, Laguna, & Ravizza,
558 2003; Thomas et al., 1999). Consequently, the control group may have naturally employed
559 goal setting and self-talk strategies during P-Company and not in training, but without having
560 been taught how to successfully make use of relaxation and imagery strategies and given the
561 opportunity to practice them, were unable to employ them as effectively during P-Company.
562 Indeed, one of the major limitations of the TOPS-2 is that it only measures use of
563 psychological skills, not ability or effectiveness.

564 Therefore, the effectiveness of imagery use between the groups during competition
565 may be due to the quality of imagery and/or type of imagery employed. Researchers have
566 identified different types of imagery, all of which serve a different purpose during a
567 performance task (Cummings & Ramsey, 2009). The use of two types of imagery in particular
568 may have influenced the results in the current study. Cognitive general imagery refers to the

569 imagery of strategies, routines, and game plans (e.g., mental rehearsal), while motivational
570 general- arousal imagery is related to the arousal and anxiety associated with competition and
571 has been used by athletes to remain calm and relaxed prior to competition (Munroe, Giacobbi,
572 Hall, & Weinberg, 2000). The experimental group were educated in the different types of
573 imagery and their purpose and, therefore, may have employed the appropriate types of
574 imagery more than the control group. However, the TOPS-2 imagery scale measures only the
575 use of imagery and does not assess the functions of imagery. Consequently, it is unclear
576 which types of imagery were employed.

577 Although it is unclear how each of these skills directly impacted on the recruits'
578 performance during P-Company, as a consequence of the PST, the recruits' ability to
579 recognize and regulate arousal levels and reduce the debilitating effects of anxiety is likely to
580 have been a key factor in achieving optimal performance (e.g., Hardy et al., 1996; Krane &
581 Williams, 2011). It is also likely that the recruits in the experimental group were able to use
582 relaxation techniques to reduce pre-performance anxiety prior to each event and regulate
583 arousal levels in order to cope with the extreme physical effort experienced on P-Company
584 (Kress & Statler, 2003; Thelwell & Greenlees, 2001). We did not measure anxiety or arousal
585 levels in recruits so we cannot be sure of this, however, future research may be warranted to
586 explore this intriguing possibility. The current intervention included all the psychological
587 skills in one package but the results from the reported use of psychological skills during
588 competition may point towards the notion that imagery and relaxation may be more important
589 skills in this context. However, the data only tentatively suggest this and future research
590 exploring which specific psychological skills impact performance and mental toughness in
591 this context is warranted.

592 Several limitations are acknowledged in this study, the first of which was the necessity
593 to adopt a random block design. While complete random allocation of participants is

594 preferred, for the reasons explained in the study design section, this was not possible.
595 Potentially, the study could also have been influenced by Hawthorne effects (Gillespie, 1991).
596 Whilst having a control group is a major strength of the current research providing a placebo
597 condition as well would have been an additional strength. This, however, was not possible
598 within the constraints of training program of the organization. While steps were taken to
599 minimize any such effects or leakage from the intervention group, we cannot rule out
600 Hawthorne effects entirely. Whilst the most parsimonious explanation of the results remains
601 that the psychological skills intervention significantly increased psychological usage, mental
602 toughness and performance, we cannot completely rule out any such Hawthorne effects.
603 Furthermore, cross contamination between groups cannot be completely ruled out. However,
604 the training was delivered to intact training platoons that start training approximately five
605 weeks apart. Therefore, we believe that the minimal interaction recruits from each group
606 would have had with each other would have minimal impact on the results.

607 It is evident that some of the effect sizes are small. One possible explanation for this is
608 that observational field studies tend to yield deflated effect sizes due to the interaction test
609 relying on observations in the corners of the design. However, these observations tend to be
610 uncommon in field studies, particularly with correlated variables (e.g., goal-setting,
611 relaxation, self-talk and imagery) (McClelland & Judd, 1993).

612 The TOPS-2 as an instrument which to measure psychological skills usage in a
613 military context has its limitations. The TOPS-2 was developed specifically for the sport
614 setting, thus whilst the measure does appear to possess adequate utility in a military context,
615 further validation work may be required to adapt the TOPS to the military. Indeed, given the
616 recent interest in psychological skill usage in the military, the development of a new military
617 specific measure may even be warranted. Although the short-term effects of the intervention
618 were promising, the long-term effects remain unknown. Future research should seek to

619 measure the continued effects on performance, perhaps even in the operational context, for
620 soldiers who have been exposed to psychological skills training early in the training cycle.
621 Further, future research should seek to identify whether the increased levels of mental
622 toughness derived from the PST are maintained over time.

623 Despite the limitations of this study, we believe that it has a number of key strengths.
624 The primary strength of the study is that it was conducted within a live elite military training
625 setting in which performance under pressure held real consequences for success and failure,
626 using an informant rating of mentally tough behavior and an ecologically valid measure of
627 performance. Furthermore, the study considerably extends the literature by being the first
628 study to control for individual fitness and leadership climate in the context of a psychological
629 skills training intervention. The findings lend support to previous studies advocating the use
630 of traditional psychological skills training packages in facilitating the development of mental
631 toughness (e.g., Bell et al., 2013; Crust & Azadi, 2010; Gucciardi et al., 2009; Kaiseler et al.,
632 2009) and previous studies that have shown PST to be a useful performance enhancing
633 strategy in a military training setting (e.g., Adler et al., 2015; DeWiggins et al., 2010;
634 Hammermeister, et al., 2010). At a more general level, the findings reinforce the general
635 consensus that theoretical, empirical and applied concepts in sport psychology can be
636 successfully applied in a military context (e.g., Fiore & Salas, 2008, Goodwin, 2008;
637 Hammermeister, et al., 2010).

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811 Table 1. *Descriptive data for dependent variables and covariates across both study conditions N=173*

Variable	Experimental Group						Control Group					
	Week 16		Week 20		P-Company		Week 16		Week 20		P-Company	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Instructor-rated Mental Toughness	4.89	(1.15)	5.10	(1.09)			4.68	(1.06)	4.58	(1.11)		
Goal-setting	3.45	(0.70)	4.00	(0.5)	3.86	(0.59)	3.38	(0.78)	3.44	(0.74)	3.68	(0.87)
Relaxation	1.82	(0.92)	2.60	(1.01)	2.77	(0.95)	1.58	(0.76)	1.65	(0.7)	2.26	(0.95)
Self-talk	3.74	(0.70)	4.11	(0.7)	3.75	(0.64)	3.70	(0.75)	3.66	(0.88)	3.57	(0.73)
Imagery	3.00	(0.79)	3.30	(0.73)	3.5	(0.61)	2.89	(0.68)	3.00	(0.85)	3.25	(0.84)
Mean Fitness score (min/s)	19.06	(1.17)	18:49	(01:10)			20:13	(01:46)	19:20	(01:11)		
Standardized Fitness score	0.35	(0.78)	0.224	(0.97)			-3.23	(1.07)	-2.07	(0.99)		
Composite Transformational Leadership	4.13	(0.64)	4.06	(0.63)			4.09	(0.64)	4.02	(0.70)		
P-Company Performance					56.07	(-9.6)					55.02	12.21

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