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The tough get tougher': Psychological skills training with elite military recruits

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25 Title: 'The tough get tougher': Psychological skills training with elite military recruits.  
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 the 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

**Method****225 Participants**

226 Data was collected from 222 male British Army Para recruits, aged between 17 and 33  
227 ( $M_{\text{age}} = 21.13$ ,  $SD 3.36$ ) and 32 Parachute Regiment corporals ( $M_{\text{age}} = 28.44$ ,  $SD 2.74$ ) 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.,  
334 .....encourages 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 a tall), 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 ( $M = 18\text{min}, 31\text{s}$ ,  $SD = 1\text{min}, 51\text{s}$ ),  
358 while the steeplechase times ranged from 17m:16s to 29 min, 28s ( $M = 20\text{m}:50\text{s}$ ,  $SD =$   
359  $1\text{m}:42\text{s}$ ). 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 ( $M_{\text{age}} =$   
457  $21.03$ ,  $SD$   $3.34$  ( $n_{\text{control}} = 90$ ;  $M_{\text{age}} = 21.07$ ,  $SD$   $3.20$ ;  $n_{\text{experimental}} = 83$ ;  $M_{\text{age}} = 21.00$ ,  $SD$   $3.51$ ).  
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



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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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