



Transformational Leadership and Task Cohesion in Sport: The Mediating Role of Inside Sacrifice

Cronin, L.D.; Arthur, C.A.; Hardy, J.T.; Callow, N.

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Transformational leadership and task cohesion in sport:
The mediating role of inside sacrifice

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24 Abstract

25 In this cross-sectional study, we examined a mediational model whereby transformational
26 leadership is related to task cohesion via sacrifice. Participants were 381 American ($M_{\text{age}} =$
27 19.87, $SD = 1.41$) Division I university athletes (188 males, 193 females) who competed in a
28 variety of sports. Participants completed measures of coach transformational leadership,
29 personal and teammate inside sacrifice, and task cohesion. After conducting multilevel
30 mediation analysis, we found that both personal and teammate inside sacrifice significantly
31 mediated the relationships between transformational leadership behaviors and task cohesion.
32 However, there were differential patterns of these relationships for male and female athletes.
33 Interpretation of the results highlights that coaches should endeavor to display
34 transformational leadership behaviors as they are related to personal and teammate inside
35 sacrifices and task cohesion.

36 *Keywords:* coaching, group dynamics, teamwork

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49 Burns (1978) describes a transformational leader as someone who “looks for potential
50 motives in followers, seeks to satisfy higher level needs, and engages the full person of the
51 follower” (p. 4). This contrasts with the traditional transactional approach to leadership
52 which articulates leadership as a quid pro quo relationship between leader and follower (e.g.,
53 the exchange of rewards for desired behavior). Bass (1995) later described transformational
54 leadership as a process that “raises follower’s awareness about issues of consequence,
55 influences followers to transcend their own self-interest for the good of the group, and causes
56 followers to work harder than they originally expected to do” (p. 469). However, little is
57 known about how transformational leaders can influence followers to sacrifice their personal
58 interests for the good of the group. Prior to discussing the transformational leadership
59 research, it is important to outline how transformational leadership has been conceptualized.

60 Traditionally, researchers have adopted two approaches to conceptualizing
61 transformational leadership: (a) a global model and (b) a differentiated approach.
62 Researchers who adopt a global approach combine the transformational leadership behaviors
63 into a single overarching construct. Conversely, researchers who adopt a differentiated
64 approach conceptualize transformational leadership as a set of distinct behaviors.
65 Furthermore, researchers who adopt a global representation suggest that differentiation
66 between the transformational leadership behaviors is unnecessary because of the high inter-
67 factor correlations between behaviors (e.g., Judge & Bono, 2000). In contrast, researchers
68 who adopt a differentiated approach propose that each transformational leadership behavior
69 should be investigated separately (Podsakoff, MacKenzie, Moorman, & Fetter, 1990) because
70 transformational leadership behaviors have different relationships with outcome variables
71 (e.g., Antonakis, Avolio, & Sivasubramaniam, 2003; Lowe, Kroeck, & Sivasubram, 1996).
72 Thus, combining transformational leadership behaviors into one global construct would
73 conceal these differential relationships. In practical terms, investigating transformational

74 leadership behaviors separately also has the advantage of allowing researchers to advise
75 leaders on what specific behaviors are most effective in promoting desired outcomes. [In this](#)
76 [study, we](#) investigated the separate effects of different transformational leader behaviors;
77 consequently, a differentiated approach was adopted.

78 [We included five transformational leadership behaviors outlined by Callow, Smith,](#)
79 [Hardy, Arthur, and Hardy \(2009\).](#) Specifically, individual consideration involves the leader
80 [recognizing individual differences and showing concern for follower's development.](#)
81 [Fostering acceptance of group goals and promoting teamwork addresses behaviors by the](#)
82 [leader which promote both teamwork/team spirit and working together to achieve team goals.](#)
83 [High performance expectations involve the leader showing that they expect high standards](#)
84 [from their team/group. Appropriate role model addresses the leader serving as a good role](#)
85 [model for their followers. Lastly, inspirational motivation involves the leader inspiring](#)
86 [others to succeed through their vision.](#) By displaying such behaviors the transformational
87 leader is said to promote positive outcomes in both followers and the group. Within sport,
88 [researchers have found](#) that transformational leadership is associated with: performance
89 (Charbonneau, Barling, & Kelloway, 2001), follower satisfaction (Rowold, 2006; Zachoratos,
90 Barling, & Kelloway, 2000), athlete effort (Arthur, Woodman, Ong, Hardy, & Ntoumanis,
91 2011; Rowold, 2006), and task cohesion (Callow et al., 2009; Smith, Arthur, Hardy, Callow,
92 & Williams, 2013).

93 Task cohesion involves team cooperation towards achieving performance goals within
94 both practice and competition environments. [As Carron, Colman, Wheeler, and Stevens](#)
95 [\(2002\) found that](#) cohesion was positively related to performance across numerous sports, it
96 is important for researchers to investigate what creates a cohesive team. [In two studies with](#)
97 [Ultimate Frisbee teams, researchers have reported](#) that the transformational leadership
98 behaviors of individual consideration, fostering acceptance of group goals and high

99 performance expectations are positively related to task cohesion (Callow et al., 2009; Smith
100 et al., 2013). Given these results, it is important to include individual consideration, fostering
101 acceptance of group goals, and high performance expectations when investigating the
102 transformational leadership to task cohesion relationship. Both appropriate role model and
103 inspirational motivation were also included as these behaviors were likely to be important in
104 the current context.

105 There are a number of reasons why these particular transformational leadership
106 behaviors should be positively related to task cohesion. To begin with, a relationship
107 between individual consideration and task cohesion can be explained by Yukelson's (1997)
108 proposition that leaders who accommodate individual differences can blend the talents of
109 individual members into a cohesive team. Fostering acceptance of group goals should also be
110 positively correlated with task cohesion. Indeed, if team members accept team goals and are
111 encouraged to work together, it is likely that task cohesion will increase as players strive
112 towards achieving these common goals. There is also a plausible reason why high
113 performance expectations should be positively associated with task cohesion. In outlining the
114 Galatea effect, Eden and Ravid (1982) propose that expectations are transferred from leader
115 to follower; thus, if leaders display high performance expectations in relation to task
116 cohesion, higher levels of task cohesion are likely to be produced in followers. Beyond the
117 transformational leadership behaviors examined in previous cohesion studies in sport, it is
118 also theorized that the transformational leadership behaviors of appropriate role modelling
119 and inspirational motivation are related to task cohesion. Appropriate role modelling is
120 suggested to be positively related to task cohesion because transformational leaders model
121 behaviors which contribute towards task cohesion, and their followers will look to emulate
122 such behaviors (Shamir, House, & Arthur, 1993). Lastly, inspirational motivation should
123 also be positively correlated with task cohesion. Inspirational motivation involves

124 articulating a collective purpose and encourages followers to adopt a shared vision; both of
125 which should bring individuals together so that they feel part of the group and positively
126 influence task cohesion (Hopton, Phelan, & Barling, 2014).

127 According to Prapavessis, Carron, and Spink's (1997) conceptual model of team
128 building, leadership impacts task cohesion through various group processes including
129 communication, team goals, and sacrifice. Using this model, Smith and colleagues (2013)
130 found that communication did mediate the relationship between transformational leadership
131 and task cohesion in sports teams. *In the present study, we investigated* if transformational
132 leadership *is related to* task cohesion via athlete sacrifice. Within organizational psychology,
133 leadership sacrifice is purported to enhance a leader's influence and has been positively
134 associated with transformational leadership and task cohesion (Choi & Mai-Dalton, 1999). *In*
135 *sport, researchers have only examined* follower sacrifice (Prapavessis & Carron, 1997).
136 These researchers defined sacrifice as "group members voluntarily initiating an action or
137 giving up prerogative or privilege for the sake of another person or persons" (Prapavessis &
138 Carron, 1997, p. 231) and conceptualized sacrifice behaviors as involving social sacrifice
139 (i.e., sacrifices athletes make in their social lives), outside sacrifice (i.e., sacrifices athletes
140 make in their personal lives), and inside sacrifice (i.e., sacrifices athletes make in practice and
141 competition). Additionally, they proposed that inside sacrifice involves both personal (e.g.,
142 sacrifices I make) and teammate (e.g., sacrifices my teammates make) inside sacrifice.

143 *Several researchers suggest* that sacrifice is related to task cohesion. Zander (1982)
144 suggested that "a participant who is asked to give up something of value for her group
145 becomes, because of this sacrifice, more attracted to that body" (p. 7). Given that task
146 cohesion involves an athlete's attraction to their team (Widmeyer, Brawley, & Carron, 1985),
147 athletes making sacrifices for their team should lead to higher perceptions of task cohesion
148 within that team. *This idea is supported by research in cricket teams, with Prapavessis and*

149 Carron (1997) finding that inside sacrifices were positively related to task cohesion. As both
150 inside sacrifices and task cohesion have salience to the specific context of practicing and
151 competing, we examined inside sacrifices only.

152 Unlike the relationship between sacrifice and task cohesion, researchers have not yet
153 examined the relationship between transformational leadership and sacrifice. However, the
154 idea that transformational leaders inspire followers to make sacrifices forms a central pillar of
155 transformational leadership theory. For example, Bass' (1985) seminal work explicitly states
156 that transformational leaders will "get us to transcend our own self-interest for the sake of the
157 team, organization, or larger polity" (p. 20). Within organizational psychology, researchers
158 have reported a positive relationship between transformational leadership and organizational
159 citizenship behaviors (e.g., Podsakoff et al., 1990). This is the closest researchers have come
160 to examining sacrifice, as organizational citizenship behaviors are similar to sacrifice
161 behaviors because they both involve engaging in behaviors which go unrewarded but
162 promote the functioning of the group. However, organizational citizenship behaviors are
163 broader than sacrifice behaviors as Organ (1988) suggests they incorporate: helping,
164 conscientiousness, sportsmanship, courtesy, and civic virtue.

165 In addition to transformational leadership theory and research on organizational
166 citizenship behaviors, there are theoretical links between specific transformational leadership
167 behaviors and athlete sacrifices. The theoretical links outlined below originate from Shamir
168 and colleague's (1993) self-concept based theory of the motivational effects of charismatic
169 leadership – a theory which overlaps considerably with transformational leadership. First,
170 individual consideration should be positively associated with athlete sacrifices. A coach who
171 treats each athlete as an individual and supports their personal development is likely to
172 enhance the athlete's personal identification with the coach; which, in turn, will motivate the
173 athlete to make sacrifices for the team. Second, fostering acceptance of group goals and

174 promoting teamwork ought to be positively correlated with follower sacrifices. By fostering
175 acceptance of group goals and promoting teamwork, the coach is likely to increase team
176 member's collective identity (i.e., identifying with team goals) and value internalization (i.e.,
177 internalizing the notion of teamwork) which will motivate followers to make sacrifices for
178 the team. Third, high performance expectations should be positively related to athlete
179 sacrifices. A leader who displays high performance expectations is likely to increase both the
180 self and collective-efficacy of followers, which will motivate these followers to make
181 sacrifices in order to meet such expectations. Appropriate role modelling ought to be
182 positively associated with follower sacrifices; as a coach who is an appropriate role model
183 will display sacrifice behaviors, which serve as a model for the sacrifices expected of
184 followers. Finally, inspirational motivation should be positively correlated with athlete
185 sacrifices; as followers who accept the collective vision of their leader, and form a collective
186 identity, are likely to engage in collective-oriented behaviors such as sacrifices.

187 Within the present study, there was a possibility of differences between male and
188 female athletes on the main study variables and more importantly, on the relationships
189 between those variables. Proponents of the sociocultural theory of sex differences (e.g.,
190 Cross & Madson, 1997; Wood & Eagly, 2010) maintain that different socialization patterns
191 result in gender differences for certain behaviors that relate to the present study's variables.
192 For example, Maccoby (1990) suggests that gender differences may be socialized during
193 childhood, with girl's interactions tending to be more prosocial and cooperative, and boy's
194 interactions placing greater emphasis on social dominance. Intuitively, both prosocial
195 behavior and cooperation could be linked to both sacrifice behavior and task cohesion.
196 Researchers have also shown that athlete gender influences perceptions of coaches' behaviors
197 (e.g., Hollebeak & Amorose, 2005) and levels of task cohesion within male and female
198 sports teams (Thompson & Albinson, 1991; Widmeyer, Brawley, & Carron, 1985). Finally,

199 gender differences for organizational citizenship behaviors (which are similar to sacrifice
200 behaviors) and group orientation have also been reported (Kashima et al., 1995; Van Dyne &
201 Ang, 1998).

202 Of further relevance to the present study is Korabik and Ayman's (2007) integrative
203 model of gender and leadership, which depicts the effect of gender on the relationships
204 between leader behaviors and follower outcomes. Specifically, Korabik and Ayman (2007)
205 propose that the interactions between leaders and followers are influenced by intrapsychic
206 processes (e.g., gender role orientation in both parties), sociodemographic gender (e.g.,
207 expectations of role behaviors), and contextual cues (e.g., the gender make-up of the group).
208 Supporting the integrative model of gender and leadership, Kacmar, Bachrach, Harris, and
209 Zivnuska (2011) found that gender influenced the relationship between leadership behaviors
210 and organizational citizenship behaviors (akin to sacrifice behaviors in the present study).
211 Furthermore, Powell, Butterfield, and Bartol (2008) reported that gender influences the
212 relationships between leadership behaviors and other outcomes such as employee effort and
213 satisfaction.

214 Based on the aforementioned theory and research, it was possible that gender
215 differences could exist for each of the study's variables and for the relationships between
216 these variables. Given such differences, in particular those relating to sacrifice (i.e., a
217 mechanism by which transformational leadership may exert its effect on task cohesion),
218 conceptually we proposed that different mediational relationships would occur in the present
219 study because of the concomitant socialization patterns that result in different behaviors
220 (Wood & Eagly, 2010) and relationships between behaviors (Korabik & Ayman, 2007).
221 Consequently, we decided that it was pertinent to conduct an exploratory examination of
222 possible gender differences within the context of our hypotheses.

223 In summary, the purpose of the present study was to examine a mediational model
224 whereby transformational leadership **is related to** task cohesion via inside sacrifice; a number
225 of specific hypotheses were tested. Based on Prapavessis and colleagues (1997) conceptual
226 framework, it was hypothesized that both personal and teammate inside sacrifice would
227 mediate the relationships between the five transformational leadership behaviors and task
228 cohesion. In accordance with previous research in sport (e.g., Callow et al., 2009), we
229 expected that all five transformational leadership behaviors would be positively related to
230 task cohesion. Based on transformational leadership theory (Bass, 1995; Shamir et al., 1993)
231 and research involving organizational citizenship behaviors (Podsakoff et al., 1990), it was
232 predicted that the five transformational leadership behaviors would be positively associated
233 with both personal and teammate inside sacrifice. In accordance with the research of
234 Prapavessis and Carron (1997), we expected that both personal and teammate inside
235 sacrifices would be positively related to task cohesion. **Lastly, due to our exploratory**
236 **examination of possible gender differences, we did not propose specific hypothesis for the**
237 **gender analysis.** Exploration of this mediation model should further our understanding of the
238 complex relationship between transformational leadership behaviors and task cohesion. In
239 practice, this should help us to advise coaches on how they can promote follower sacrifices
240 and task cohesion in their teams.

241 Method

242 Participants

243 Participants comprised of 388 American Division I university athletes. Seven
244 coaches had only one athlete complete the survey; therefore, these athletes' responses were
245 removed. This gave a sample of 381 athletes ($M_{\text{age}} = 19.9$, $SD = 1.4$) that rated 38 different
246 coaches. The sample included both female ($n = 193$) and male ($n = 188$) athletes from
247 interactive sports (e.g., volleyball, water polo, $n = 225$) and co-active sports (e.g., golf,

248 tennis, $n = 156$). In total, 101 female athletes had a male coach and 92 female athletes had a
249 female coach, whereas 181 male athletes had a male coach and 7 male athletes had a female
250 coach. In all cases, the 38 head coaches (male = 18, female = 10) were full-time paid
251 coaches in charge of teams containing both scholarship and non-scholarship athletes.

252 **Measures**

253 **Transformational leadership.** The Differentiated Transformational Leadership
254 Inventory for Sport (DTLI; Callow et al., 2009) was used to assess coaches'
255 transformational leadership behaviors. The following transformational leadership behaviors
256 were selected: individual consideration¹ (4 items; e.g., "my coach treats each team member as
257 an individual"), fostering acceptance of group goals (3 items; e.g., "my coach gets the team to
258 work together for the same goal"), high performance expectations (4 items; e.g., "my coach
259 expects us to achieve high standards"), appropriate role model (4 items; e.g., "my coach sets a
260 good example for team members to emulate"), and inspirational motivation¹ (4 items; e.g., "my
261 coach develops, articulates and inspires others with his/her vision for the future"). Each item
262 was scored on a scale ranging from 1 (*Not at all*) to 5 (*All the time*). Previous research has
263 supported the validity and reliability of the DTLI (e.g., Arthur et al., 2011; Smith et al.,
264 2013). Nonetheless, a confirmatory factor analysis (CFA) was conducted on the 5-factor
265 scale using AMOS (Arbuckle, 2010). This 5-factor model indicated an adequate fit, χ^2
266 (142) = 403.02, $p < .01$, RMSEA = 0.07, CFI = 0.94, TLI = 0.93. The Cronbach's alpha
267 coefficients were as follows: individual consideration (.86), fostering acceptance of group
268 goals (.82), high performance expectations (.80), appropriate role model (.89), and
269 inspirational motivation (.84). These reliability scores were deemed acceptable based on
270 Nunnally and Bernstein's (1994) criterion of .70 for the psychological domain.

271 **Inside sacrifice.** Players' perceptions of inside sacrifice were measured using the
272 Group Sacrifice Scale (GSS; Prapavessis & Carron, 1997). After conducting an EFA,

273 these researchers found that the GSS displayed four components: inside sacrifice, outside
274 sacrifice, personal social sacrifice, and teammate social sacrifice. However, as indicated
275 earlier, we focused on inside sacrifice. As sacrifice was originally conceptualized by
276 Prapavessis and Carron (1997) as involving a personal and a teammate dimension, we
277 decided to separate inside sacrifice into personal inside sacrifice (8 items; e.g., “I am
278 willing to carry out responsibilities I don’t like for the good of the team”) and teammate
279 inside sacrifice (8 items; e.g., “my teammates are willing to put aside their own personal
280 goals if they conflict with the team’s goal”). All items are rated on a scale ranging from 1
281 (*Strongly disagree*) to 9 (*Strongly agree*).

282 As the GSS has only been used in one published study, we conducted a CFA on
283 the two inside sacrifice subscales. Both the personal inside sacrifice, $\chi^2 (20) = 296.48, p <$
284 $.01, RMSEA = 0.19, CFI = 0.80, TLI = 0.72,$ and teammate inside sacrifice, $\chi^2 (20) =$
285 $438.5, p < .01, RMSEA = 0.24, CFI = 0.84, TLI = 0.78,$ scales indicated a poor fit. Based
286 on theoretical reasons and modification indices for theta delta, three items were deleted.
287 First, “I am willing to carry out responsibilities I am not competent at for the good of the
288 team” was removed because it was thought that undertaking responsibilities one is not
289 competent at might be considered counterintuitive by some athletes. Second, “I am
290 willing to accept playing less when not performing to the best of my abilities for the good
291 of the team” was removed. As sacrifice involves giving up something for the ‘good’ of
292 the team, we felt that even if some players are not performing to their best, they may still
293 believe they are better than their teammates, and therefore this item could be construed as
294 being somewhat ambiguous. Finally, “I am willing not to engage in verbal conflict with
295 my opponents for the good of the team” was removed as verbal conflict is, at times, part
296 of competitive sport and can be used for the good of the team when competing. After
297 deleting these three items in each subscale, a two-factor model of personal and teammate

298 inside sacrifice indicated an adequate fit, $\chi^2(29) = 67.90, p < .01, RMSEA = 0.06, CFI =$
299 $0.97, TLI = 0.98$. The Cronbach's alpha coefficient was .79 for personal inside sacrifice
300 and .90 for teammate inside sacrifice.

301 **Task cohesion.** Task cohesion was measured using the positively worded Group
302 Environment Questionnaire (GEQ; Eys, Carron, Bray, & Brawley, 2007). Eys and
303 colleagues (2007) have shown that this nine-item scale provides greater internal consistency
304 than the original positively and negatively worded version. Example items include: "I like
305 the style of play of this team" and "we all take responsibility for any loss or poor
306 performance by our team." Each item is scored on a scale ranging from 1 (*Strongly*
307 *disagree*) to 9 (*Strongly agree*). The psychometric properties of the GEQ have repeatedly
308 been demonstrated; see Carron, Brawley, and Widmeyer (1998) for a review. In the present
309 study, task cohesion displayed a Cronbach's alpha coefficient of .90.

310 **Procedures**

311 Following institutional ethical approval, athletes were recruited by contacting the
312 head coach of each respective team. After obtaining informed consent from all
313 participants, the full survey was administered electronically. Lonsdale, Hodge, and Rose
314 (2006) highlight the equivalence of online and paper-and-pencil surveys in sports research.
315 All of the data were collected at mid-season, giving athletes sufficient time to form
316 accurate perceptions of all study variables. To ensure consistency, each team completed
317 the surveys three days prior to competing and each athlete completed the survey
318 anonymously. Additionally, the surveys were counterbalanced with the first half of the
319 sample completing the survey in one order (i.e., transformational leadership, inside
320 sacrifices and task cohesion) and the second half completing the survey in the opposite
321 order.

322 **Data Analyses**

323 Given that the present dataset consisted of two hierarchical levels, the athlete
324 (Level 1) and the coach (Level 2), the nested nature of the data needed to be addressed.
325 To statistically analyze whether it was appropriate to use a multilevel framework,
326 intraclass correlation coefficients were calculated. Intraclass correlation coefficients
327 define the proportion of between-group variance to total variance. In the present sample,
328 the intraclass correlation coefficients were as follows: individual consideration (.22),
329 fostering acceptance of group goals (.20), high performance expectations (.35),
330 appropriate role model (.27), inspirational motivation (.18), personal inside sacrifice (.05),
331 teammate inside sacrifice (.18), and task cohesion (.28). According to Julian (2001)
332 intraclass correlation coefficients greater than .05 indicate that a meaningful proportion of
333 variance is due to group membership and multilevel analysis is appropriate. Therefore, a
334 multilevel framework was adopted for the present study.

335 We employed MLwiN to conduct multilevel analyzes (Rasbash, Browne, Healy,
336 Cameron, & Charlton, 2013). When conducting multilevel analysis, one must first decide
337 whether to include fixed or random effects at Level 2. We used the likelihood ratio test
338 (Rasbach, Steele, Browne, & Goldstein, 2012) to assess whether Level 2 effects should be
339 fixed or random. This test involves comparing a model where the Level 2 variances are
340 constrained to 0 (fixed effect model) and a model where the Level 2 variances are free to
341 vary (random effect model). In practical terms, this meant subtracting the *-2loglikelihood*
342 of the fixed effect model from the *-2loglikelihood* of the random effect model and then
343 comparing this figure to a chi square distribution on one degree of freedom (when testing
344 variance in intercepts) and two degrees of freedom (when testing the variance in slopes).
345 After reviewing the results of the loglikelihood ratio tests, we found that in all cases a
346 random intercept fixed slope model best represented the data.

347 The data were group mean centered for all analyses. This decision was taken as

348 Enders and Tofighi (2007) suggest that group mean centering is optimal when Level 1
349 (i.e., person level) relationships are of primary interest. However, centering decisions in
350 multilevel analysis are a complex issue, a discussion of which is beyond the scope of the
351 present study. For a comprehensive discussion of centering in a sports context, please
352 refer to Myers, Brincks, and Beauchamp (2010).

353 Testing for mediation in multilevel analysis is also a complex issue. In order to test
354 for mediation, we used the Monte Carlo Method for Assessing Mediation (MCMAM;
355 MacKinnon, Lockwood, & Williams, 2004; Bauer, Preacher, & Gil, 2006). This required
356 the use of Selig and Preacher's (2008) MCMAM calculator to estimate confidence
357 intervals for the indirect effect. [Similar to previous studies \(e.g., Smith et al., 2013\)](#), the
358 confidence interval (CI) was set at 95% and 20,000 repetitions were specified. There is
359 evidence of mediation when zero is not included within the lower and upper bound CI.

360 In addition to the previously outlined analysis procedures, regression coefficients
361 for each gender were directly compared by conducting a joint chi-square test in MLwiN.
362 This involved entering [data for](#) both males and females into the regression equation and
363 comparing the joint chi-square test statistic against a chi-square distribution with 1 degree
364 of freedom. A detailed description of this procedure is available from the Bristol Centre
365 for Multilevel Modelling (2011).

366 Results

367 Descriptive Statistics

368 Descriptive statistics, reliability estimates and intercorrelations are displayed in
369 Table 1. The correlations [indicated](#) that both gender and sport type was significantly
370 correlated with most of the other study variables. Independent samples *t*-tests [showed](#)
371 that male athletes displayed higher mean scores than female athletes for individual
372 consideration, $t(379) = 5.05, p < .001$, fostering acceptance of group goals, $t(379) = 4.57,$

373 $p < .001$, appropriate role model, $t(379) = 4.93$, $p < .001$, inspirational motivation, $t(379)$
374 $= 4.09$, $p < .001$, teammate inside sacrifice, $t(379) = 8.12$, $p < .01$, and task cohesion,
375 $t(379) = 5.76$, $p < .001$. Results also indicated that interactive sports displayed higher
376 scores than co-active sports for high performance expectations, $t(379) = 4.17$, $p < .001$,
377 personal inside sacrifice, $t(379) = 4.97$, $p < .001$, and teammate inside sacrifice, $t(379) =$
378 3.16 , $p < .01$. Consequently, prior to conducting the main analyses the data was
379 standardized within gender and sport type.

380 **Main Analyses**

381 For the overall sample, the direct effects for transformational leadership behaviors
382 on task cohesion were all significant: individual consideration, $\beta_1 = .47$, $SE = .04$, $p < .01$;
383 fostering acceptance of group goals, $\beta_1 = .53$, $SE = .04$, $p < .01$; high performance
384 expectations, $\beta_1 = .38$, $SE = .06$, $p < .01$; appropriate role model, $\beta_1 = .46$, $SE = .05$, $p <$
385 $.01$; and inspirational motivation, $\beta_1 = .39$, $SE = .05$, $p < .01$.

386 **Hypothesis 1.** The relationship between individual consideration and task
387 cohesion will be mediated by inside sacrifice.

388 With personal inside sacrifice as the mediator, the a path (individual consideration
389 to personal inside sacrifice) and the b path (personal inside sacrifice to task cohesion)
390 were both significant and positive (see Table 2). The 95% CI for the indirect effect
391 excluded zero indicating that personal inside sacrifice mediates the relationship between
392 individual consideration and task cohesion. With teammate inside sacrifice as the
393 mediator, the a path (individual consideration to teammate inside sacrifice) and the b path
394 (teammate inside sacrifice to task cohesion) were also both significant and positive. In
395 addition, the 95% CI for the indirect effect did not include zero indicating that teammate
396 inside sacrifice also mediates the individual consideration to task cohesion relationship.

397 **Hypothesis 2.** The relationship between fostering acceptance of group goals and

398 task cohesion will be mediated by inside sacrifice.

399 With personal inside sacrifice as the mediator, the *a* path (fostering acceptance of
400 group goals to personal inside sacrifice) and the *b* path (personal inside sacrifice to task
401 cohesion) were both significant and positive (see Table 2). The 95% CI for the indirect
402 effect excluded zero indicating that personal inside sacrifice mediates the relationship
403 between fostering acceptance of group goals and task cohesion. With teammate inside
404 sacrifice as the mediator, the *a* path (fostering acceptance of group goals to teammate
405 inside sacrifice) and the *b* path (teammate inside sacrifice to task cohesion) were both
406 significant and positive. The 95% CI for the indirect effect did not include zero
407 indicating that teammate inside sacrifice also mediates the fostering acceptance of group
408 goals to task cohesion relationship.

409 **Hypothesis 3.** The relationship between high performance expectations and task
410 cohesion will be mediated by inside sacrifice.

411 With personal inside sacrifice as the mediator, the *a* path (high performance
412 expectations to personal inside sacrifice) and the *b* path (personal inside sacrifice to task
413 cohesion) were both significant and positive (see Table 2). The 95% CI for the indirect
414 effect excluded zero indicating that personal inside sacrifice mediates the relationship
415 between high performance expectations and task cohesion. With teammate inside
416 sacrifice as the mediator, the *a* path (high performance expectations to teammate inside
417 sacrifice) and the *b* path (teammate inside sacrifice to task cohesion) were both significant
418 and positive. The 95% CI for the indirect effect did not include zero indicating that
419 teammate inside sacrifice also mediates the high performance expectations to task
420 cohesion relationship.

421 **Hypothesis 4.** The relationship between appropriate role model and task cohesion
422 will be mediated by inside sacrifice.

423 With personal inside sacrifice as the mediator, the *a* path (appropriate role model
424 to personal inside sacrifice) and the *b* path (personal inside sacrifice to task cohesion)
425 were both significant and positive (see Table 2). The 95% CI for the indirect effect
426 excluded zero indicating that personal inside sacrifice mediates the relationship between
427 appropriate role model and task cohesion. With teammate inside sacrifice as the
428 mediator, the *a* path (appropriate role model to teammate inside sacrifice) and the *b* path
429 (teammate inside sacrifice to task cohesion) were both significant and positive. The 95%
430 CI for the indirect effect did not include zero indicating that teammate inside sacrifice
431 also mediates the appropriate role model to task cohesion relationship.

432 **Hypothesis 5.** The relationship between inspirational motivation and task
433 cohesion will be mediated by inside sacrifice.

434 With personal inside sacrifice as the mediator, while the *a* path (inspirational
435 motivation to personal inside sacrifice) was non-significant, the *b* path (personal inside
436 sacrifice to task cohesion) was significant and positive (see Table 2). The 95% CI for the
437 indirect effect included zero indicating that personal inside sacrifice does not mediate the
438 relationship between inspirational motivation and task cohesion. In contrast, with
439 teammate inside sacrifice as the mediator, both the *a* path (inspirational motivation to
440 teammate inside sacrifice) and the *b* path (teammate inside sacrifice to task cohesion)
441 were significant and positive. Moreover, the 95% CI for the indirect effect did not
442 include zero indicating that teammate inside sacrifice mediates the inspirational
443 motivation to task cohesion relationship.

444 **Exploratory Gender Analyses**

445 In the present study, male athletes rated their coaches higher on individual
446 consideration, fostering acceptance of group goals, appropriate role model, and
447 inspirational motivation as compared to female athletes. Males also rated their teams

448 higher on task cohesion than females. Given such initial gender differences in our results,
449 gender differences in previous research and a priori reasoning, we decided to explore the
450 effect of gender on our study hypotheses.

451 For both genders the direct effects for leadership behaviors on task cohesion were
452 all significant: individual consideration, males $\beta_1 = .51$, $SE = .07$, $p < .01$, females $\beta_1 = .42$,
453 $SE = .06$, $p < .01$; fostering acceptance of group goals, males $\beta_1 = .54$, $SE = .07$, $p < .01$,
454 females $\beta_1 = .51$, $SE = .06$, $p < .01$; high performance expectations, males $\beta_1 = .50$, $SE =$
455 $.08$, $p < .01$, females $\beta_1 = .29$, $SE = .08$, $p < .01$; appropriate role model, males $\beta_1 = .44$, SE
456 $= .07$, $p < .01$, females $\beta_1 = .46$, $SE = .07$, $p < .01$; and inspirational motivation, males $\beta_1 =$
457 $.46$, $SE = .07$, $p < .01$, females $\beta_1 = .33$, $SE = .07$, $p < .01$. Comparison of the regression
458 coefficients indicated no gender differences for the relationship between transformational
459 leadership and task cohesion.

460 In contrast to the direct effects, there were some differences in the nature of the
461 mediation for male and female athletes (see Table 3). For males, personal inside sacrifice
462 consistently mediated the relationships between the transformational leadership behaviors
463 and task cohesion (the only exception was inspirational motivation). For females,
464 personal inside sacrifice only mediated the relationship between fostering acceptance of
465 group goals and task cohesion. The results were markedly different for teammate inside
466 sacrifice. For males, teammate inside sacrifice only mediated the relationships between
467 individual consideration and high performance expectations and task cohesion. For
468 females, teammate inside sacrifice mediated the relationships between all five
469 transformational leadership behaviors and task cohesion. However, despite this distinct
470 differential pattern of relationships, there were no gender differences when the *a* and *b*
471 paths for males and females were compared directly. In other words, for some paths the
472 magnitude of the regression coefficients was significantly greater than zero but when the

473 strength of these coefficients was compared across males and females, no difference
474 emerged.

475 **Discussion**

476 The purpose of this study was to examine a mediational model whereby
477 transformational leadership is related to task cohesion via sacrifice. Through our findings,
478 we provide support for the conceptual model of team building (Prapavessis et al., 1997) and
479 transformational leadership theory (Bass, 1995). Specifically, we found that inside sacrifices
480 mediated the relationships between the transformational leadership behaviors examined and
481 task cohesion. Interestingly, we found some initial evidence that the nature of the mediation
482 was different for males and females.

483 The primary aim of the current research was to test the conceptual model of team
484 building (Prapavessis et al., 1997). We found support for one of the main predictions of this
485 model; namely, that the leadership to cohesion relationship will be mediated by sacrifice.
486 More specifically, we demonstrated that inside sacrifices mediated the relationships between
487 individual consideration, fostering acceptance of group goals, high performance expectations,
488 appropriate role model, inspirational motivation and task cohesion. The only exception was
489 that personal inside sacrifice did not mediate the relationship between inspirational
490 motivation and task cohesion. Taken together, the results presented here, along with Smith
491 and colleagues (2013) findings, provide support for one of the major contentions of the
492 conceptual model of team building (Prapavessis et al., 1997); namely, that of mediation.
493 Indeed, both inside sacrifices and communication (Smith et al., 2013) have now been found
494 to mediate the relationship between transformational leadership and task cohesion in sports
495 teams. However, there are several other potential mediators that would be worth considering.
496 For example, team goals and cooperation were also highlighted in Prapavessis and colleagues
497 (1997) model.

498 In relation to transformational leadership theory, we found support for one of the
499 central tenets of the theory; that transformational leaders will influence followers to transcend
500 their own self-interest for the good of the group. Similarly, within organizational
501 psychology, Podsakoff and colleagues (1990) found a positive relationship between
502 transformational leadership and organizational citizenship behaviors. In our particular study,
503 we found that all five transformational leadership behaviors were related to both personal and
504 teammate inside sacrifice (with the exception of inspirational motivation to personal inside
505 sacrifice). This is an important step for the transformational leadership literature in general
506 and for transformational leadership research in sport. Specifically, these findings indicate the
507 important role that coaches play in influencing their athletes to make sacrifices for the team.
508 Indeed, coaches should display individual consideration, high performance expectations,
509 fostering acceptance of group goals, and appropriate role modelling as these behaviors are
510 related to athlete sacrifices. For example, coaches could help individual athletes to develop
511 their strengths and work on their weaknesses (e.g., through performance profiling), set
512 realistic and ambitious goals for the team (e.g., to score two goals per game), consistently
513 highlight the importance of group goals (e.g., by discussing team goals before and during
514 practice sessions), and role model the sacrifice behaviors they expect from team members
515 (e.g., staying behind after scheduled practice to work with individual players). Furthermore,
516 interventions designed to encourage these transformational leadership behaviors (e.g.,
517 teaching coaches how they might increase these behaviors within practice sessions) should
518 have an effect on athlete sacrifices.

519 Another key finding of the present study was that personal and teammate inside
520 sacrifices were related to task cohesion. Similarly, Prapavessis and Carron (1997) found that
521 inside sacrifices were related to task cohesion in male cricket teams. This result also supports
522 Zander's (1982) contention that making a sacrifice for the group causes a person to become

523 more attracted to that group. In practical terms, [we suggest](#) that raising awareness of the
524 sacrifices made by individual athletes and the team as a whole may be a viable method of
525 increasing task cohesion. For example, a coach could highlight that team members have
526 played with minor injuries, carried out responsibilities they did not like (e.g., playing out of
527 position) and put aside their personal goals for the good of the team. Additionally, a coach
528 could require players to make visible sacrifices for the benefit of the team (e.g., organizing
529 the equipment before and after practice), or a team building intervention could encourage
530 athletes to commit (either verbally or in writing) to making sacrifices for the benefit of the
531 team. At this stage, it is important to acknowledge that some sacrifices may be of detriment
532 to the individual but benefit the team (e.g., playing whilst injured). In this case, a responsible
533 coach would always put the health of each individual athlete ahead of the team. Perhaps
534 future research could investigate other potential negative consequences of transformational
535 leadership (e.g., burnout).

536 One of the interesting [but preliminary findings](#) that emerged from this study were
537 those involving athlete gender. For male athletes, personal sacrifices were a more consistent
538 mediator of the transformational leadership to task cohesion relationship as compared to
539 teammate sacrifices. In contrast, for female athletes the perception of teammate sacrifices
540 played a greater role in the mediation as compared to personal sacrifices. [This provides](#)
541 [initial support for Korabik and Ayman's \(2007\) integrative model of gender and leadership,](#)
542 [whereby gender affects the relationship between leader behaviors and follower outcomes.](#)
543 [According to these researchers, leader behaviors and follower outcomes are influenced by](#)
544 [intrapyschic processes \(e.g., gender role orientation in both parties\), sociodemographic](#)
545 [gender \(e.g., expectations of role behaviors\), and contextual cues \(e.g., the gender make-up of](#)
546 [the group\).](#) It also seems possible that a greater group orientation amongst females (Kashima
547 et al., 1995) could help explain this finding. In this regard, it seems possible that females are

548 more interested in what the group is sacrificing, as opposed to their own personal sacrifices.
549 However, because group orientation was not measured in this study, further research is
550 needed to investigate such a claim.

551 When testing for mediation, we also noted that different transformational leadership
552 behaviors had different relationships with the sacrifices made by male and female athletes.
553 However, it is important to note that whilst the relationships were different (i.e., some of the
554 coefficients from males' and females' data were significantly different from zero while others
555 were not), there were no differences when we directly compared male and female regression
556 coefficients (i.e., for all paths, coefficients for males and females were not different from
557 each other). Within sport, this is the first study to offer preliminary evidence that gender may
558 play a part in the relationships between transformational leadership behaviors and certain
559 follower outcomes. As this is the first investigation to present such data, further research is
560 needed to clarify these initial findings. However, when considering the current findings and
561 given that not all leadership behaviors were related to follower sacrifices, some support for a
562 differentiated view of transformational leadership (Podsakoff et al., 1990) is provided. By
563 using this differentiated approach, practitioners can target specific leadership behaviors in the
564 applied setting (cf. Antonakis et al., 2003) and researchers can examine the differential
565 effects of various leadership behaviors (Podsakoff et al., 1990). Based on our results, we
566 suggest that coaches should be aware that different transformational leadership behaviors
567 exist and can be more or less effective in inducing sacrifices made by male and female
568 athletes. For instance, fostering acceptance of group goals was the only behavior related to
569 personal inside sacrifice in female athletes; whereas, individual consideration, high
570 performance expectations, appropriate role model, and fostering acceptance of group goals
571 were related to personal inside sacrifices in male athletes. Thus, a coach of a female team
572 may focus on fostering acceptance of group goals when trying to encourage individual

573 athletes to make sacrifices; whereas, a coach of a male team might emphasize individual
574 consideration, high performance expectations, appropriate role model, and fostering
575 acceptance of group goals. Again, it is possible that fostering acceptance of group goals (i.e.,
576 a group oriented behavior) is particularly important for females due to a greater group
577 orientation (Kashima et al., 1995).

578 Another gender finding of note was that female athletes rated their coaches lower on
579 all five transformational leadership behaviors when compared to male athletes. This differed
580 from research in business, with Bass and colleagues (1996) showing that females rated their
581 leaders higher on transformational leadership than males. With regard to task cohesion, we
582 found that female athletes rated their teams lower on task cohesion than their male
583 counterparts. This contradicts Widmeyer and colleagues (1985) finding that female teams
584 were higher than male teams on task cohesion but confirms Thompson and Albinson's (1991)
585 finding that male teams are higher on task cohesion. A possible explanation for the present
586 findings is that, in a traditionally male dominated arena such as sport, higher quality coaches
587 gravitate towards male teams. Thus, male athletes rate their coaches higher on
588 transformational leadership and their team higher on task cohesion. Taken as a whole, the
589 above findings indicate the possibility of gender differences in relation to transformational
590 leadership, inside sacrifices and task cohesion in sport. However, given the exploratory
591 nature of the findings and the smaller sample sizes for each gender, we would encourage
592 future research to further consider the possibility and empirically test possible gender
593 differences.

594 As with many studies, the present investigation had a number of limitations which
595 need to be highlighted. First, with any self-report data there is concern with social
596 desirability and the truthfulness of responses. However, we hoped that online data collection,
597 which is associated with increased privacy (Tourangeau, 2004), would have reduced the

598 effect of social desirability and ensured truthful responses in our study. Second, as all data
599 was collected at one time-point, common method bias could be a cause for concern.
600 However, the use of different response formats for the independent, mediator and dependent
601 variables should have reduced possible common method bias (Podsakoff, MacKenzie, Lee, &
602 Podsakoff, 2003). Future studies could reduce possible common method bias further by
603 obtaining the independent and dependent variables from different sources, measuring
604 independent and dependent variables in different contexts, or by introducing a time lag
605 between the measurement of the independent and dependent variables (Podsakoff et al.,
606 2003). Alternatively, future research could use a marker variable (a variable unconnected to
607 the variables under study) to statistically control for common method bias (Podsakoff et al.,
608 2003). Third, the sample used in the present study (i.e., university athletes) was relatively
609 homogenous with regard to performance level. Given that performance level has been shown
610 to moderate the relationship between transformational leadership behaviors and task cohesion
611 (Callow et al., 2009), this may limit the generalizability of the present findings. A final
612 limitation is the correlational nature of this study, which means that causality cannot be
613 established between variables. Future prospective longitudinal or experimental studies
614 should investigate the causal relationships between transformational leadership, inside
615 sacrifices and task cohesion. In doing so, relevant data concerning alternative sequential
616 steps (e.g., transformational leadership—cohesion—sacrifice) would be generated.

617 In summary, [through this study we have extended](#) our understanding of the positive
618 consequences of transformational leadership behaviors in sport. Our findings [indicated](#) that
619 individual consideration, fostering acceptance of group goals, high performance expectations,
620 appropriate role model, and inspirational motivation are related to task cohesion through both
621 personal and teammate inside sacrifices. This provides us with some understanding of how a
622 transformational leader can influence follower sacrifices and team cohesion in sport.

623 Furthermore, this is the first study to show that different transformational leadership
624 behaviors may have different relationships with the sacrifices made by male and female
625 athletes, offering support for a differentiated view of transformational leadership. A practical
626 application of the current results suggests that interventions designed to develop specific
627 leadership behaviors, as well as promote sacrifice behaviors in athletes, should enhance the
628 task cohesion of sports teams.

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Table 1
Summary of means, standard deviations, intercorrelations and alpha coefficients

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	-	-	-									
2. Sport type	-	-	-.14**	-								
3. Individual consideration	3.77	.90	-.25**	.13**	(.86)							
4. Fostering acceptance of group goals	3.94	.87	-.23**	-.10	.62**	(.82)						
5. High performance expectations	4.35	.73	-.04	-.22**	.31**	.58**	(.80)					
6. Appropriate role model	3.56	1.00	-.25**	.03	.70**	.75**	.53**	(.89)				
7. Inspirational motivation	4.11	.76	-.21**	.01	.70**	.69**	.38**	.69**	(.84)			
8. Personal inside sacrifice ^a	7.13	1.35	-.07	-.25**	.15**	.27**	.25**	.22**	.13*	(.79)		
9. Teammate inside sacrifice ^b	6.42	1.60	-.15**	-.16**	.26**	.29**	.29**	.31**	.23**	.63**	(.90)	
10. Task cohesion	6.74	1.53	-.28**	.03	.56**	.41**	.41**	.57**	.48**	.32**	.59**	(.90)

Note. Alpha coefficients are displayed in parentheses. ^a revised 5-item scale. ^b revised 5-item scale.

* $p < .05$, ** $p < .01$.

Table 2
Multilevel mediation analyses for all study hypotheses

	<i>a</i> path		<i>b</i> path		95% CIs	
	β	<i>SE</i>	β	<i>SE</i>	Lower	Upper
Mediator: Personal inside sacrifice						
Hypothesis 1						
Individual consideration	.15*	.06	.24**	.05	.01	.07
Group level variability	.06	.04	.31**	.09		
Individual level variability	.92**	.07	.65**	.05		
Hypothesis 2						
Fostering acceptance of group goals	.20**	.06	.24**	.05	.02	.09
Group level variability	.06	.04	.31**	.09		
Individual level variability	.91**	.07	.65**	.05		
Hypothesis 3						
High performance expectations	.22**	.07	.24**	.05	.02	.10
Group level variability	.06	.04	.31**	.09		
Individual level variability	.91**	.07	.65**	.05		
Hypothesis 4						
Appropriate role model	.19**	.06	.24**	.05	.01	.08
Group level variability	.06	.04	.31**	.09		
Individual level variability	.91**	.07	.65**	.05		
Hypothesis 5						
Inspirational motivation	.11	.06	.24**	.05	-.00	.06
Group level variability	.06	.04	.31**	.09		
Individual level variability	.93**	.07	.65**	.05		
Mediator: Teammate inside sacrifice						
Hypothesis 1						
Individual consideration	.22**	.05	.48**	.04	.06	.16
Group level variability	.17**	.06	.34**	.09		
Individual level variability	.79**	.06	.51**	.04		
Hypothesis 2						
Fostering acceptance of group goals	.24**	.05	.48**	.04	.07	.17
Group level variability	.18**	.06	.34**	.09		
Individual level variability	.79**	.06	.51**	.04		
Hypothesis 3						
High performance expectations	.22**	.06	.48**	.04	.04	.16
Group level variability	.17**	.06	.34**	.09		
Individual level variability	.81**	.06	.51**	.04		
Hypothesis 4						
Appropriate role model	.21**	.06	.48**	.04	.04	.16
Group level variability	.18**	.06	.34**	.09		
Individual level variability	.80**	.06	.51**	.04		
Hypothesis 5						
Inspirational motivation	.16**	.06	.48**	.04	.02	.14
Group level variability	.17**	.06	.34**	.09		
Individual level variability	.81**	.06	.51**	.04		

Note. *a* path denotes independent variable and mediator variable. *b* path denotes mediator variable and dependent variable. Task cohesion was the dependent variable in all hypotheses. Confidence intervals were generated using the Monte Carlo Method for Assessing Mediation. * $p < .05$, ** $p < .01$.

Table 3
Multilevel mediation analyses for males and females separately

	<i>a</i> path		<i>b</i> path		95% CIs	
	β	<i>SE</i>	β	<i>SE</i>	Lower	Upper
Mediator: Personal inside sacrifice						
Hypothesis 1						
Individual consideration						
Males	.21**	.08	.26**	.07	.01	.11
Females	.12	.08	.22**	.06	-.01	.07
Hypothesis 2						
Fostering acceptance of group goals						
Males	.18*	.09	.26**	.07	.00	.11
Females	.20*	.08	.22**	.06	.01	.09
Hypothesis 3						
High performance expectations						
Males	.27**	.10	.26**	.07	.02	.14
Females	.17	.09	.22**	.06	-.00	.09
Hypothesis 4						
Appropriate role model						
Males	.27**	.09	.26**	.07	.02	.14
Females	.12	.09	.22**	.06	-.01	.07
Hypothesis 5						
Inspirational motivation						
Males	.15	.08	.26**	.07	-.00	.09
Females	.07	.08	.22**	.06	-.02	.06
Mediator: Teammate inside sacrifice						
Hypothesis 1						
Individual consideration						
Males	.22**	.08	.45**	.07	.03	.18
Females	.23**	.08	.51**	.06	.04	.21
Hypothesis 2						
Fostering acceptance of group goals						
Males	.13	.09	.45**	.07	-.02	.15
Females	.37**	.07	.51**	.06	.11	.27
Hypothesis 3						
High performance expectations						
Males	.20*	.10	.45**	.07	.00	.19
Females	.25**	.09	.51**	.06	.04	.23
Hypothesis 4						
Appropriate role model						
Males	.17	.09	.45**	.07	-.00	.17
Females	.27**	.08	.51**	.06	.06	.23
Hypothesis 5						
Inspirational motivation						
Males	.10	.08	.45**	.07	-.02	.12
Females	.24**	.08	.51**	.06	.04	.21

Note. *a* path denotes independent variable and mediator variable. *b* path denotes mediator variable and dependent variable. Task cohesion was the dependent variable in all hypotheses. Confidence intervals were generated using the Monte Carlo Method for Assessing Mediation. * $p < .05$, ** $p < .01$

¹ It is important to note that these behaviors are conceptual additions from the MLQ-5X (Bass & Avolio, 2005), and as such contain a total of 3 items from the MLQ-5X, and 3 items that have been modified from the original MLQ-5X items. All six items were reproduced by special permission of the publisher, MIND GARDEN Inc., www.mindgarden.com, from the “Multifactor Leadership Questionnaire for Research” by Bernard M. Bass and Bruce J. Avolio. Copyright 1995 by Bernard M. Bass and Bruce J. Avolio. All rights reserved. Further reproduction is prohibited without the Publisher’s written consent.