

35 **Abstract**

36 **Purpose:** To determine the profile of high-performing college soccer teams through the use of
37 exploratory hierarchical linear modeling (HLM) based on a socio-cognitive approach.

38 **Design and Measures:** A correlational design was employed in this study. The sample
39 consisted of 340 college soccer players of both genders (178 female and 162 male), representing
40 17 different teams (8 female and 9 male) ranked in the top-32 of the National Association of
41 Intercollegiate Athletics (NAIA). Numerous demographic and soccer-related variables
42 represented level-1 in the HLM model. Group Environment Questionnaire and Team Assessment
43 Diagnostic Measure were entered as level-2 variables, representing cohesion and team mental
44 models, respectively. Perceived performance potential (PPP) served as the dependent variable.
45 Objective performance scores were correlated with PPP, attesting a moderate to high-level of
46 criterion related validity ($r = .78$).

47 **Results:** The final model suggested that: (1) International athletes perceive their performance
48 lower than others, (2) different field positions share different covariance coefficients with PPP,
49 and (3) perception of social cohesion from a group, rather than individual, standpoint is
50 positively associated with perceptions of team performance.

51 **Conclusions:** High performing teams have clearly defined task-related and team-related goals.
52 Accordingly, social rather than task related factors may represent a competitive edge, further
53 energizing the interactions and performance of top-ranked teams. International athletes perceive
54 team performance lower than locals, perhaps due to differences in preferred game-style and
55 acculturation experiences. Players from different field positions (i.e., goalkeepers, defensive, and
56 offensive players) relate differently to team performance in college soccer.

57 **Keywords:** Team expertise; Team Mental Models; Cohesion; HLM; Soccer.

58 **Profile of High-Performing College Soccer Teams: An Exploratory Multi-Level Analysis**

59 There is a general agreement that people achieve more when working in synchrony towards
60 a shared goal: “the whole is greater than the sum of its parts.” In this regard, team expertise is a
61 cross-domain research topic and numerous scholars seek to understand how successful sport
62 teams, airline pilots, music orchestras, and even global diplomats evolve implicit and explicit
63 coordination mechanisms (Salas, Rosen, Burke, Goodwin, & Fiore, 2006). Nonetheless,
64 capturing team expertise is challenging because both individual and team-level factors influence
65 the development of high-performing teams (Eccles & Tenenbaum, 2004). In a nutshell, previous
66 research suggests that team expertise is about finding the “ideal mix” of individuals’
67 backgrounds and skills, while promoting team values and coordination (i.e., synchronized action
68 and effort among teammates) (see Gratton & Erickson, 2007). Therefore, we advanced an
69 exploratory hierarchical linear model considering both individual and team-level factors related
70 to team performance. Specifically, we assessed the influence of soccer players’ personal
71 characteristics on team performance. We subscribed to a socio-cognitive approach based on the
72 notion that teammates’ social dynamics (e.g., cohesion) influence individuals beliefs and
73 cognitions (e.g., performance expectations), which in turn influence team members’ social
74 dynamics (Eccles & Tenenbaum, 2014). [To this extent, social cognition has been defined as](#)
75 [“information processing in social setting” \(Frith, 2008, p. 2033\) and considered the result of how](#)
76 [social stimuli influence perceptions of group processes.](#) Moreover, with numerous frameworks to
77 choose from (e.g., collective-efficacy, leadership), we opted to limit the scope of our inquiry to
78 the notions of team cohesion and team mental models. From a theoretical standpoint, cohesion
79 has been associated with the development of team processes such as team mental models (Carron
80 & Hausenblas, 1998), while found to be moderated by a number of personal factors (see Carron,

81 Colman, Wheeler, & Stevens, 2002) considered in the model tested herein. Finally, both
82 cohesion and team mental models have been linked to team performance and expertise in sports
83 (Carron, Eys, & Burke, 2007; Eccles & Tenenbaum, 2004).

84 **Team Cohesion**

85 Team cohesion is defined as “a dynamic process that is reflected in the tendency of a group
86 to stick together and remain united in the pursuit of its instrumental objectives and/or for the
87 satisfaction of member affective needs” (Carron, Brawley, & Widmeyer, 1998, p. 213). Task and
88 social cohesion are the two sub-dimensions underlying the overarching notion of team cohesion.
89 Task cohesion refers to the degree that members of a team bond to accomplish a task, thus
90 remaining united to achieve shared performance related goals. Social cohesion pertains to the
91 notion of teammates bonding for social reasons, thus reflecting the extent that members of a team
92 like to interact and enjoy each other’s company (Carron, Eys, & Burke, 2007; Carron,
93 Widmeyer, & Brawley, 1985; Widmeyer, Brawley, & Carron, 1985). Based upon the notions of
94 task and social cohesion, Carron et al. (1985) proposed the Conceptual Model of Group
95 Cohesion for Sport. This framework considers each athlete’s perceptions about his/her particular
96 social and task attraction to the team (“I, my, or me” perceptions). Furthermore, this framework
97 considers athletes’ perceptions about “team unity” (“us, our, or we” perceptions), as related to
98 “the similarity, closeness, and bonding, within the team as a whole around the group task”
99 (Widmeyer et al., 1985, p. 17). In the present study, “I” beliefs were entered as level-1 factors,
100 and “us” beliefs were treated as level-2 factors, with performance serving as the dependent
101 variable.

102 It is important to note that performance has also been hypothesized to influence team
103 cohesion and vice-versa (Carron et al., 2002). In fact, the relationship between cohesion and

104 performance has been extensively studied across domains, and two meta-analytic reviews have
105 summarized the magnitude of the cohesion-performance relationship (Carron et al., 2002;
106 Mullen & Copper, 1994). Mullen and Copper's meta-analysis (1994) included 49 studies from
107 general, military, and sport psychology. Results revealed a significant, positive, and small effect
108 size (d) for the cohesion-performance relationship ($d = .25, p < .01$). In another meta-analytic
109 review, Carron et al. (2002) found a large effect size for the cohesion-performance relationship
110 in sports. Carron et al. also reported a strong relationship between performance and social ($d =$
111 $.70$) and task cohesion. ($d = .61$).

112 Research based on Carron et al.'s (1985) Conceptual Model of Group Cohesion for Sport
113 has also revealed that team members' attributes may serve as moderators of the cohesion-
114 performance relationship (Carron et al., 2002; Carron et al., 2007). To this extent, Carron and
115 Hausenblas (1998) have long noted that team member attributes influence group structure which
116 in turn impact the cohesion-performance relationship. Based on this rationale, we focused on
117 statistically modelling the influence of team members' attributes (individual characteristics,
118 level-1 variables) on team performance. In particular, we examined the influence of both team
119 members' *demographic* and *role attributes* on team performance. Pertaining to team members'
120 demographic attributes, we assessed athlete gender and nationality. This is consistent with
121 previous research suggesting that the cohesion-performance relationship differ among female
122 and male teams, and that cultural issues may impact group cohesion in sports (Popp, Hums, &
123 Greenwell, 2010). Furthermore, we used class status (i.e., freshman, sophomore, junior, senior)
124 as an indicator of athletic experience, another factor influencing performance in college sports
125 (Watt & Moore, 2001).

126 Regarding team members' role attributes, we explored the influence of individuals'
127 soccer characteristics (i.e., field position, laterality, starter status) on team performance. In this
128 regard, field position has been linked to the development of group processes and performance in
129 team sports (Filho, Gershgoren, Basevitch, Schinke, & Tenenbaum, in press). For instance,
130 midfielders occupy centralized positions where the access to information is maximized, whereas
131 other players (goalkeepers, defenders and offensive players) have unique assignments during
132 competition (Di Salvo et al., 2007). Also noteworthy, laterality has been proposed as a factor
133 linked to performance in team sports (Carey et al., 2001). Specifically, Carey et al. noted that
134 left-footed players are rare and thus may have advantages because (a) defenders are most
135 practiced against right foot opponents, and (b) left-footed plays are more likely to access visuo-
136 spatial creativity networks in the right cerebral hemisphere. Finally, athletes' starter status have
137 been found to influence team dynamics, with higher status athletes (e.g., starters) showing
138 greater perceptions of satisfaction and cohesion than lower status athletes (e.g., substitutes) (see
139 Jeffery-Tosoni, Eys, Schinke, & Lewko, 2011). Previous research on expert performance in
140 soccer revealed that highly skilled athletes tend to possess greater awareness of their
141 performance outcomes than their less skilled counterparts (Basevitch, Ward, Ericsson, Ehrlinger,
142 & Filho, 2010). Accordingly, given starters are (in principle) the more skilled players, it is
143 plausible that they evaluate performance differently than substitutes. In all, we examined the
144 relationship among athletes' personal factors (i.e., starter status, laterality, field position and
145 college experience), perceptions of cohesion (social and task), and team performance. Moreover,
146 we were also interested in testing the influence of team mental models on team performance.

147 **Team Mental Models**

148 The term “Team Mental Models” (TMM) has been used to denote research on team
149 cognition because it clearly conveys that “the locus of interest is on team functioning, and it is
150 stated broadly enough to encompass both similarity and accuracy properties” (Mohammed,
151 Ferzandi, & Hamilton, 2010, p. 4). More specifically, TMM is defined as “the collective task and
152 team relevant knowledge that team members bring to a situation” (Cooke, Salas, Cannon-
153 Bowers, & Stout, 2000, p. 153). Accordingly, TMM are thought to enhance team performance
154 through the development of (a) coordination mechanisms, and (b) task-specific and team related
155 knowledge (see Eccles & Tenenbaum, 2004; Ward & Eccles, 2006).

156 Team coordination was recently defined as “the process of arranging team members’
157 actions so that, when they are combined, they are in suitable relation for the most effective
158 result” (Eccles & Tran, 2012, p. 32). Noteworthy, the importance of explicit and implicit
159 coordination mechanisms has been noted by scholars from various domains (Eccles &
160 Tenenbaum 2004; Entin & Serfaty, 1999; Mohammed et al., 2012). Explicit coordination refers
161 to verbal communication used to facilitate division of labor among teammates, whereas implicit
162 coordination pertains to the ability of teammates to articulate team level actions without the need
163 for verbal communication (Ward & Eccles, 2006). To this extent, Entin and Serfaty (1999)
164 noticed that naval teams adapt to highly stressful situations by creating implicit coordination
165 mechanisms.

166 When developing team coordination, one should also keep in mind that team actions must
167 be synchronized in function, time, and space. In this regard, Eccles (2010) has proposed *action*
168 *type*, *action timing* and *action location* as the three important antecedents of team coordination.
169 Action type pertains to one’s expectation or anticipation of an upcoming action made by a
170 teammate. The accuracy of this anticipatory mechanism is crucial to one’s ability to prepare

171 him/herself to future events. Action timing relates to the ability of team members to correctly
172 align their actions “on the fly,” thus avoiding “too early” or “too late” responses. Lastly, Eccles
173 highlighted that optimal coordination is environmentally situated at a specific space. Hence, it is
174 important that teammates anticipate what is about to happen “where” (space).

175 Team expertise has also been linked to the similarity and accuracy of *task-specific* and
176 *team-related knowledge* (Cooke et al., 2000). Task-related knowledge is task-specific and
177 idiosyncratically distributed among team members. Team-related knowledge refers to
178 “knowledge held by teammates and their collective understanding of the current situation”
179 (Cooke et al., 2000, p. 154), and involves communal understanding of team procedures,
180 strategies, and contingency plans. According to Mohammed et al. (2010), task-related knowledge
181 specifies “what needs to be accomplished” by each team member, whereas team-related
182 knowledge refers to work coordination (i.e., “how work needs to be accomplished”). Of note,
183 both task-specific and team related knowledge have been found to be associated with team
184 performance in open skill motor tasks (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers
185 (2000).

186 The importance of team and task-related knowledge is particularly evident in soccer
187 matches. For instance, goalkeepers possess highly task-specific knowledge, which is also
188 essential to overall team performance (Ward & Eccles, 2006). On the other hand, team
189 performance is also dependent on the tactical knowledge of all players who enter the pitch. Thus,
190 soccer players must hold common knowledge (i.e., team-related knowledge) regarding their team
191 strategies (e.g., team formation such as 1-4-3-3 or 1-3-5-2). It is also important to note that task-
192 specific and team-related knowledge are developed over time, and especially in moments of
193 action (i.e., *during* practice and training) (see Eccles & Tenenbaum, 2004). Accordingly, we

194 collected data at the end of the competitive cycle, in agreement with the notion that a group of
195 individuals undergo a process of development before evolving task-specific and team-related
196 knowledge. Moreover, we relied on the expert-performance approach, thus only focusing on the
197 performance dynamics (i.e., moderating variables) of highly-ranked soccer teams.

198 In all, we sought to determine the profile of high-performing college soccer teams through
199 the use of exploratory hierarchical linear modeling (HLM) based on a socio-cognitive approach
200 reflecting the notions of cohesion and TMM. We expected that demographic and soccer related
201 variables would predict perceived performance potential (see Figure 1). This is consistent with
202 the overall notion that individual characteristics (e.g., gender, nationality, field position)
203 moderate perceptions of team outcome (Carron et al., 2007). Furthermore, we expected that (at
204 least) one latent factor representing group perceptions of socio-cognitive factors (i.e., Cohesion
205 and TMM) would add explicative power to subjective accounts of team performance. This is
206 congruent with (1) the theoretical notion that socio-cognitive factors are linked to team expertise
207 (see Eccles & Tenenbaum, 2004), and (2) methodological guidelines on parsimonious HLM
208 model, in which latent factors must be added on a “one by one” basis (Raudenbush & Bryk,
209 2002).

210 **Methods**

211 **Participants**

212 Three hundred and forty college soccer players of both genders (178 female -52.40%; and
213 162 male - 47.60%) representing 17 different teams (8 female and 9 male) affiliated to the
214 National Association of Intercollegiate Athletics (NAIA) agreed to participate in the study. The
215 17 teams represented in this study were from nine different states (Alabama, California, Florida,
216 Iowa, Kansas, Kentucky, Michigan, Montana, and Ohio). Participants were 20.38 years old on

217 average ($SD = 2.12$) and had 14.66 years ($SD = 3.92$) of experience in the sport. On average, the
218 participants had been playing for their respective teams for 2.40 years ($SD = 1.11$). They were
219 predominantly Caucasians (70.60%) and “other races” (15.20%). Black/Afro-Americans
220 represented 6.60%, and Hispanic/Latinos represented 4.20% of the total sample size. American
221 Indian/Alaskan Native represented .09% ($n = 3$). Two Japanese ($n = 2$) and one Korean also
222 participated in this study. Five student athletes (i.e., 1.50%) chose not to report their ethnic
223 background.

224 **Instrumentation**

225 **Demographic Questionnaire.** A detailed demographic form was utilized to collect
226 normative data. Specifically, participants’ age, nationality, ethnicity, **starter status** (i.e., starter or
227 substitute), field position (i.e., goalkeeper, defender, midfielder, offense), laterality (i.e., right or
228 left footed), years of experience in soccer, and class (i.e., freshman, sophomore, junior, senior)
229 were obtained. This data were deemed important to characterize the study’s sample.
230 Furthermore, this information was used to estimate the linkage between participants’ soccer
231 experience and profile, and perceived team performance.

232 **Group Environment Questionnaire (GEQ; Widmeyer et al., 1985).** The GEQ, a
233 conceptually-driven instrument, has been the primary choice of sport psychologists interested in
234 studying cohesion in team sports for the past 25 years (Carron et al., 2002; Carron et al., 2007).
235 Hence, given its theoretical and applied representativeness, the GEQ was chosen as the
236 measurement tool pertaining to cohesion. Specifically, the GEQ is an 18-item measure, with
237 anchors ranging from 1 (i.e., *strongly disagree*) to 9 (i.e., *strongly agree*), which measures team
238 cohesion as related to the following four dimensions: (a) Individual Attraction to the Group-
239 Social (ATG-S; e.g., “Some of my best friends are on this team.”); (b) Individual Attraction to

240 the Group-Task (ATG-T; e.g., “I like the style of play on this team.”); (c) Group Integration-
241 Social (GI-S; e.g., “Our team would like to spend time together in the off-season.”), and (d)
242 Group Integration Task (GI-T; e.g., “Our team is united in trying to reach its performance
243 goals.”). Of note, ATG-S and ATG-T aim at capturing each athlete’s perceptions concerning
244 his/her particular social and task attraction to the team individual. On the other hand, GI-S and
245 GI-T aim at capturing each athlete’s perceptions of the team “as a whole”. Notwithstanding,
246 there is empirical evidence supporting the factorial properties of the instrument, as well as its
247 content, concurrent and predictive validities (Carron et al., 1998). Furthermore, Carron et al.
248 (1998) reported that Cronbach alphas for the four hypothetical dimensions of the GEQ are for the
249 most part satisfactory (i.e., $\alpha \geq .70$). In the present study, items were reversed when needed and
250 Cronbach alpha coefficient ranged from .56 to .75. The entire scale’s alpha reliability was .85.

251 **Team Assessment Diagnostic Measure (TADM; Johnson et al., 2007).** The TADM was
252 designed to measure sharedness of team-related knowledge. This 15-item questionnaire, with
253 anchors ranging from 1 (i.e., *strongly disagree*) to 5 (i.e., *strongly agree*), reflects the following
254 five factors: (a) General Task and Team Knowledge (GTTK; e.g., “My team usually discusses
255 our goals and attains the agreement of each other.”); (b) General Task and Communication Skills
256 (GTC; e.g., “My team communicates with each other while performing our task.”); (c) Attitudes
257 towards Group Teammates and Task (GTT; e.g., “My team takes pride in our work.”), (d) Team
258 Dynamics and Interactions (GTI; e.g., “My team solves problems that occur while doing our
259 task.”), and (e) Team Resources and Working Environment (TRWE; e.g., “My team knows the
260 environmental constraints when we perform our work.”). These factors were found to have
261 satisfactory reliability coefficients (i.e., $\alpha \geq .75$) and to account for 82% of the variance on

262 sharedness of team-related knowledge (Johnson et al., 2007). In this study, Cronbach alpha
263 coefficients ranged from .74 to .84 and the entire scale's alpha reliability was .91.

264 **Team Outcome Questionnaire** (TOQ; see Coleman, 2011; Appendix H). The TOQ
265 consists of 9 items that describe goals related to team skills, strategy, effort, competitive
266 outcomes, and fitness. These areas were selected based on a content analysis of team
267 performance expectations conducted by Brawley, Carron and Widmeyer (1992). The TOQ uses a
268 Likert-type scale ranging from 0 (i.e., *low expectations*) to 4 (i.e., *high expectations*) to measure
269 perceived performance potential (PPP) in team sports. An exploratory factor analysis resulted in
270 a unidimensional scale with homogeneous items accounting for 54.71% of the variability on
271 team performance expectation. Internal consistency across all items was satisfactory resulting in
272 a Cronbach alpha coefficient of .89.

273 The TOQ was utilized to assess perceived performance potential (PPP), which is a
274 subjective account of a team's performance from the perspective of a team member. In fact, PPP
275 is a cross-domain topic pertaining to the performance of working teams in business, sports, and
276 the military (Stumpf, Doh, & Tymon, 2010). Furthermore, the notion of PPP is also congruent
277 with a current probabilistic, rather than deterministic, view of performance in sports (Kamata,
278 Tenenbaum, & Hanin, 2002). In particular, subjective reports may better represent an athletes'
279 performance experience as purely objective scores may misrepresent referee mistakes, an
280 outstanding performance from an opposing individual or team, among other situational and
281 environmental constraints (e.g., bad weather, injury) (see Chelladurai, 2007). Moreover, a
282 subjective account of performance was deemed methodologically appropriate as cohesion and
283 TMM scores represented self-perceptions rather than objective values. Notwithstanding, team's
284 objective performance (mean points as measured by the number of wins, ties and losses) were

285 correlated with TOQ scores, resulting in a .78 coefficient, which thereby suggest a moderate to
286 high degree of criterion-related validity regarding the notion of PPP.

287 **Procedures**

288 Institutional Review Board approval was obtained prior to the commencement of this
289 study. Participants were educated about the overarching theme of the study and signed an
290 informed consent form. Data were collected during the NAIA finals, a single-elimination
291 tournament involving the top 32 teams in this college division. Specifically, NAIA college
292 soccer coaches were contacted, and upon agreement, a time was scheduled to meet their
293 respective players. The athletes were informed about the study rationale, and upon voluntary
294 agreement, were asked to sign the written informed consent. Participants received a package of
295 questionnaires (i.e., GEQ, TADM, and the demographic form), presented in a randomized order
296 to control for learning and motivational effects. Data were collected one day before a decisive
297 playoff game at the national tournament. Specifically, data collection occurred in a quiet
298 environment (meeting rooms) and coaches were not present during data collection. Participants
299 had played a median of 20 matches ($M = 19.7$, $SD = 1.39$) over the season prior to the study,
300 consistent with the notion that a group of individuals undergo a process of development before
301 becoming a “team” (Eccles & Tenenbaum, 2004).

302 **Data Analysis**

303 A two-level hierarchical linear model (HLM) was tested with individual variables
304 representing level-1 and team-level constructs representing level-2. Figure 1 is a schematic
305 descriptive summary as well as a graphic representation of all variables considered in the HLM
306 analysis. The dependent variable PPP was transformed into percentage scores to allow for ease
307 of interpretation of the estimated regression coefficients. Furthermore, with the exception of

308 ATG-T and ATG-S scores, all level-1 variables were dummy coded as follow: (a) *gender* (0 =
309 female / 1 = male); (b) *nationality status* (0 = local citizen / 1 = international); (c) *laterality* (0 =
310 left footed / 1 = right footed); (d) *starter status* (0 = substitute / 1 = starter); (e) *class status* with
311 its four independent entries as freshman, sophomore, junior, senior (0 = no / 1 = yes); and (f)
312 *field position* with its four independent clusters being goalkeeper, defender, midfielder, and
313 offensive player (0 = no / 1 = yes). As such, the dummy coded variables were treated as fixed
314 effects, whereas ATG-T and ATG-S scores (ranging from 1 to 9) were conceptualized as random
315 effects in the tested model. Furthermore, level-1 variables were treated as raw, non-centered
316 scores given that there was (1) an interest in estimating the unique contribution of each level-1
317 predictor, and (2) no occasion in which a value of zero represented either an undesirable or
318 unreasonable score. Level-2 variables were treated as random effect and consisted of all TADM
319 subscales (i.e., GTTK, GTC, GTT, GTI and TRWE) and the group level scales from the GEQ
320 measure (i.e., GI-S and GI-T). Due to space limitations, only the unconditional and the final
321 model were defined in the text. Prior to the model test, descriptive and psychometric analyses
322 were computed for all TADM and GEQ subscales.

323 **Results**

324 **Demographics**

325 Prior to the regression analysis, the frequency distribution of the dummy coded variable
326 was computed. All variables exceeded the minimum 5% response rate suggested as a guideline
327 for survey, regression based studies in the human and social sciences (Creswell, 2008). The
328 participants were primarily in their junior (i.e., 33.2%) and freshman (i.e., 29.7%) years.
329 Sophomores and seniors represented 16.9% and 19.8% of the total sample size, respectively. The
330 majority of players were right-footed (i.e., 72.3%) and “starters” (i.e., 61.3%), whereas the

331 remaining 27.7% were left-footed with 38.7% identifying themselves as “substitutes.”
332 Goalkeepers constituted 11.1% of the total sample size; defenders, midfielders and offensive
333 players represented 30.1%, 36.1% and 22.7%, respectively. Overall, 66.8% of the total sample
334 size was American citizens, whereas the remaining 33.2% identified as international student-
335 athletes.

336 **Psychometrics**

337 **Reliability Analyses.** Means, standard deviation, statistical range and estimates of
338 internal consistency reliability of the model’s variables are presented in Table 1. Means represent
339 aggregated scores in accordance with HLM standard procedures. Most internal consistency
340 coefficients were above the minimal cut-off value of .70. The exceptions were the ATG-S and
341 ATG-T subscales with values of .56 and .63, respectively. Given that this high measurement
342 error could not be corrected, as item analysis did not warrant the removal of any item, these
343 subscales scales were not included in the level-1 HLM model as initially proposed. Indeed,
344 scholars have suggested psychometrical revisions of the GEQ, particularly advocating for either
345 (1) a simpler (i.e., with less sub-dimensions) factorial solution (Carless & De Paola, 2000), or (2)
346 a modified questionnaire containing only positively worded items (Eys, Carron, Bray, &
347 Brawley, 2007).

348 **Correlational Analyses.** Correlation coefficients are presented in Table 2. The values
349 across the GEQ subscales (i.e., ATG-T, ATG-S, GI-T, and GI-S) ranged from .23 to .51,
350 suggesting that task and social cohesion shared variance but are still relatively independent
351 constructs. Correlation coefficients involving the TADM subscales (i.e., GTTK; GTC; GTT;
352 TDI; TRWE) were between .48 and .76, indicating a higher degree of convergent validity among
353 the team mental model factors measured in this study. Noteworthy, given that level-2 variables

354 must be entered on a “one by one” basis in HLM models, any potential multicollinearity threat
355 ($r > .70$) could be identified and controlled for upon model testing. Moreover, coefficients
356 among the GEQ, TADM, and TOQ composite scores ranged from .25 to .55, hence suggesting a
357 degree of convergent validity, while also signaling a degree of divergent validity, and thus
358 reduced multicollinearity threats. As noticed before, TOQ scores and objective performance
359 scores showed a correlation of .78, thereby indicating a moderate to high degree of criterion-
360 related validity.

361 **Unconditional Model**

362 Once the psychometric properties of each scale were found to be reliable, we tested the
363 initial unconditional model (defined below) in which no independent variables were used.
364 Results indicated significant variation in the means of PPP across soccer teams. Specifically, the
365 intra-class correlation for this model indicated that 9.5% of the PPP was due to between-groups
366 differences. Hence, a hierarchical solution was warranted as outcome scores (slopes) differed by
367 team membership. The grand mean estimate was $\gamma_{00} = 82.22$ ($p < .01$), and represents the average
368 value of PPP across soccer teams. Furthermore, the value reliability of the sample was
369 appropriated (i.e., $< .70$), indicating that 86.5% of the variation in the PPP means reflect true
370 variation between soccer teams. The deviance for this model was of $\chi^2(2) = 2662.46$, thus
371 establishing an initial goodness-of-fit index for subsequent model comparison.

372 *Level-1 Model*

$$373 \text{ PPP}_j = \beta_{0j} + r_{ij},$$

374 *Level-2 Model*

$$375 \beta_{0j} = \gamma_{00} + u_{0j}$$

376 where,

377 β_{0j} is the intercept. and r_{ij} is the residual

378 γ_{00} is the grand mean outcome (PPP) in the population

379 u_{0j} is a random effect for soccer team j

380 **Level-1 Modeling**

381 **Model 1A.** Coefficients, standard error, and p -value for all tested variables are given in in
382 Table 3. Noteworthy, this model included all individual level-1 variables (see Figure 1) with the
383 exception of ATG-T and ATG-S, which were excluded due to high measurement error. The
384 value reliability of the sample increased to 88.4% and deviance decreased to $\chi^2(2) = 2590.16$
385 when compared to the unconditional model. Nonetheless, this model was not considered final as
386 the variables “gender,” “laterality,” “[starter status](#),” and none of the classes’ status entries (i.e.,
387 freshman, sophomore, junior, senior) were significant. Furthermore, the dummy coded entry
388 “midfielders” did not yield significant results, and thus was also excluded from the next tested
389 model.

390 **Model 1B.** Results for all tested variables are given in Table 4. All independent variables
391 included in this model (i.e., nationality, goalkeeper, defender, offensive player) were found to be
392 significant ($p < .05$). Specifically, international players ($\gamma_{10} = -4.09$, $p = .02$) were found to have
393 lower perceptions of team performance than their non-international counterparts. Predicted
394 scores on PPP were also different depending on one’s field position, with the exception of
395 “midfielders”. Specifically, estimated PPP coefficients for goalkeepers ($\gamma_{20} = 4.50$, $p = .04$),
396 defensive ($\gamma_{30} = 5.23$, $p < .01$) and offensive ($\gamma_{40} = 5.38$, $p < .01$) players showed slightly
397 different magnitudes. Noteworthy, the values for the sample reliability (i.e., 88.6%) and deviance
398 [$\chi^2(2) = 2630.16$] were indicative of a better model fit when compared to the unconditional
399 model. Accordingly, the next step involved the consideration of group-level variables.

400 **Level-2 Modeling**

401 **Model 2 (Final Model).** The results for this model are provided in Table 5 and its terms
 402 are defined below.

403 *Level-1 Model*

$$404 \text{ PPP}_{ij} = \beta_{0j} + \beta_{1j}*(Nationality_{ij}) + \beta_{2j}*(Goalkeeper_{ij}) + \beta_{3j}*(Defense_{ij}) + \beta_{4j}*(Offense_{ij}) + r_{ij}$$

405 *Level-2 Model*

$$406 \beta_{0j} = \gamma_{00} + \gamma_{01}*(GI-S_Mean_j) + u_{0j}$$

$$407 \beta_{1j} = \gamma_{10}$$

$$408 \beta_{2j} = \gamma_{20}$$

$$409 \beta_{3j} = \gamma_{30}$$

$$410 \beta_{4j} = \gamma_{40}$$

411 β_{0j} : Mean for PPP for group j considering GI-S scores, and controlling for international,
 412 goalkeeper, defensive player, and offensive player status (0 or 1, dummy variables).

413 β_{1j} : The predicted change in PPP when “international” is equal to one in soccer team j,
 414 controlling for all other independent variables.

415 β_{2j} : The predicted change in PPP when “goalkeeper” is equal to one in soccer team j,
 416 controlling for all other independent variables.

417 β_{3j} : The predicted change in PPP when “defensive player” is equal to one in soccer team j,
 418 controlling for all other independent variables.

419 β_{4j} : The predicted change in PPP when “offensive player” is equal to one in soccer team j,
 420 controlling for all other independent variables.

421 r_{ij} : It represents the deviations of PPP from its predicted value for individual i in group j.

422 Congruent with guidelines on multi-level inquiries (Raudenbush & Bryk, 2002), an a
423 priori exploratory analysis was conducted to determine which level-2 variables must be included
424 in the model on a “one by one” basis. This analysis revealed that including TDI, GI-T and GI-S
425 would produce similar contributions to a potential final model. The inclusion of TDI and GI-T
426 into the regression matrix did not yield significant intercepts, and thus these terms were excluded
427 from further analysis. However, the inclusion of GI-S yielded a significant coefficient ($\gamma_{00} =$
428 $54.26, p < .01$) while also representing an overall improvement to the previously tested Model 2.
429 Specifically, reliability of the sample mean remained high (88.5%) and deviance scores were
430 lowered to $\chi^2(2) = 2624.79$. Computation of the pseudo R-square score indicated that this model
431 represented an improvement of 5% to the unconditional model. Perhaps more importantly, the
432 final model (product of an exploratory analysis and which terms are defined below) made
433 theoretical and applied sense, as athletes’ “individual characteristics” such as field position and
434 nationality, as well as teammate’s perception of social cohesion have been proposed as potential
435 moderators of team performance (Carron et al., 2007).

436 In essence, this final model suggested that (1) “being an international player” is
437 negatively associated with PPP scores ($\gamma_{10} = -3.93, p = .02$); (2) different field positions share
438 different covariance coefficients with PPP (i.e., goalkeepers $\gamma_{20} = 4.61, p = .04$; defensive players
439 $\gamma_{30} = 5.19, p < .01$; offensive players $\gamma_{40} = 5.43, p < .01$), with the exception of “midfielders”
440 where no significant effect was found; and (3) perception of social cohesion from a group
441 standpoint (i.e., GI-S aggregated scores) is positively related to PPP ($\gamma_{01} = 3.88, p < .01$).
442 Therefore, considering the final coefficients estimated for this sample (see Table 5), the lowest
443 “error free” hypothetical PPP value (i.e., 54.21 out of 100) would (a) be given by the equation
444 $PPP = 54.26 + 3.88 *(1) - 3.93*(1) + 4.61*(0) + 5.19*(0) + 5.43*(0)$; and (b) represent an

445 international midfielder whose team's aggregated GI-S scores is the lowest possible (i.e., 1). The
446 maximum hypothetical PPP score (94.56 out of 100) would (a) be given by the equation PPP
447 $= 54.26 + 3.88 *(9) - 3.93*(1) + 4.61*(0) + 5.19*(0) + 5.43*(1)$; and (b) represent an offensive
448 player whose team's aggregated GI-S perception is the highest possible (i.e., 9).

449 **Discussion**

450 Few researchers have examined the characteristics and components that predict
451 successful performance of sport teams (Eccles & Tran, 2012; Raab & Johnson, 2007). The
452 dynamic nature and complexity of team sports (e.g., coordination, communication, and cohesion)
453 make it difficult to study the relationship among individual and team characteristics, and team
454 performance. Nonetheless, researchers in recent years have attempted to elucidate the
455 components (and relationship among them) that are required to achieve team success and
456 expertise (Eccles & Tenenbaum, 2004; Fiore et al., 2007). We examined how individual
457 characteristics (i.e., demographic factors and soccer characteristics) and team socio-cognitive
458 factors (i.e., cohesion and team mental models) were related to perceived team performance (i.e.,
459 PPP) using a multilevel analysis approach. The findings indicated that individual (i.e., nationality
460 and field position) and team factors (i.e., social cohesion) significantly contributed to the
461 prediction of perceived performance. In the following sections, the predictive value of each
462 individual and team socio-cognitive factor is discussed.

463 **Individual Characteristics**

464 **Gender.** Results indicated that gender did not significantly contribute to the prediction of
465 PPP. This is somewhat surprising, because gender differences were observed in previous studies
466 examining the relationship between social (e.g., cohesion) variables and performance in the sport
467 setting (Carron et al., 2002). Furthermore, gender differences have been observed in various

468 other cognitive variables (e.g., spatial abilities; Cahill, 2005). However, it seems that in
469 predicting perceived team performance gender differences were minute. In the current study, the
470 level of the players and teams were relatively similar (i.e., the top 32 teams in the nation)
471 regardless of gender. Thus, it is reasonable to assume that females and males perceived their
472 performance in a similar manner. Future studies should examine the influence of gender on the
473 relationship between PPP and other socio-cognitive factors such as efficacy and leadership.

474 **International status (international/local).** In regards to differences between
475 international and local (i.e., American) players, findings suggested that international players
476 perceived their team's performance at a lower level than local players did. Two possible
477 explanations for these findings are that (a) international players usually come to the USA after
478 playing at higher levels of competition, and (b) international soccer players have higher
479 performance expectations (Popp et al., 2010). Thus, these factors might influence players'
480 perception of success and may lead to a more realistic or "pessimistic" perception of team
481 performance. Future studies should gather qualitative data using in-depth interviews to gain
482 access to the players' thoughts and understand the rationale for the differences between
483 international and local players. Finally, team-building interventions aimed at converging players'
484 performance expectations (e.g., setting common team goals and norms), as well as at facilitating
485 acculturation experiences of international players, should be implemented by coaches and sport
486 psychologists working in team sport settings.

487 **Class status (freshman/sophomore/junior/senior).** Class status was not a significant
488 predictor of PPP. It appears that the number of years playing soccer at the collegiate level may
489 not be associated with perceived performance. Previous studies have shown that the more
490 experienced and skilled athletes are better able to evaluate their own individual performance

491 (Basevitch et al., 2010). However, college players at this level are close in age and soccer
492 experience, and thus may share a similar understanding of what constitutes optimal and less than
493 optimal performance in team sports. Studies based on the expert-novice paradigm or with a
494 broader target sample (e.g., comparing younger versus older professionals) may elicit potential
495 differences in individuals' perceptions of team performance.

496 **Starter Status.** However, the findings relating to starter status were not significant.
497 Indeed, high-performing teams tend to be less influenced by the formal labeling and status of
498 their members (e.g., starter and substitute, CEO and employee, airline pilot and co-pilot). This so
499 called "leveling effect" is essential to achieve optimal coordination and performance outcomes
500 under time and environmental constraints (Gratton & Erickson, 2007). It is also possible that the
501 starter role in collegiate soccer does not differentiate among skill levels given that substitutions
502 are unlimited, thus allowing for frequent changes in teams' lineups during official matches (see
503 rules at <http://www.naia.org>). In addition, all the teams surveyed for the current study qualified
504 to the final tournament, and players were likely to be mentally prepared and aware of their role
505 differences. Furthermore, typically coaches only bring the top 16-18 players to the tournament.
506 This number of players may represent an ideal team size (i.e., not too large, not too small) that
507 aggregates all resources needed for optimal performance. To this extent, size has been found to
508 moderate team performance, with too large or too small teams being associated with poorer
509 collective outcomes (Carron et al., 2007).

510 Although no differences were found between starters and substitutes, it is important to
511 continue studying the influence of individual rank on expertise development and, perhaps most
512 importantly, on psychological well-being in team sports. Again, previous research has shown
513 that higher ranked athletes show greater perceptions of social cohesion and personal satisfaction

514 for ability utilization (Jeffery-Tosoni et al., 2011). There are also research on how rule
515 modification may maximize the participation of all team members, particularly in leagues (Hill
516 & Green, 2008). Overall, advancing knowledge on how to promote psychological well-being
517 among athletes from different skill levels remains a paramount purpose of sport psychology.

518 **Laterality.** Dominance of left/right leg did not provide any predictive value to the model.
519 Thus, the perception of team performance is not different among left and right-footed soccer
520 players. The players' understanding of their own role (i.e., task-specific knowledge) in relation to
521 the team's overarching goals and coordination dynamics (i.e., team related knowledge) may be
522 more important to performance than laterality by itself. To this extent, Wood and Aggleton
523 (1989) conducted an extensive historical survey on the linkage between laterality and
524 performance ratings among soccer, cricket and tennis players. They found no evidence that left-
525 handed/footed players possess any neurological innate advantage over right-handed/footed
526 players. Thus, the unusually high proportion of left-handed/footed elite athletes is probably due
527 to the fact that right-handers/footers are unaccustomed to face left-handed/footed opponents, thus
528 lacking specific schemas to defend from their strategies and movements.

529 **Field positions (goalkeeper/defender/midfielder/offensive).** The findings suggest that
530 prediction of PPP is dependent on the player's field position, with exception of midfielders in
531 which no effect was found. In soccer, each position has different objectives and demands (Di
532 Salvo et al., 2007). Thus, perhaps the differences in perceived team performance among the
533 positions stem from the manner in which they evaluate their team performance. For example, if a
534 game ends in a 3-3 tie, offensive players might perceive team performance as a positive
535 outcome, while defenders and goalkeepers will perceive team performance as a negative result,
536 with midfielders perceiving the outcome with mixed feelings. Thus, in adapting this rationale,

537 the evaluation of team performance is relative to the objectives and demands of the player's field
538 position.

539 Notwithstanding, the lack of predictive power for midfielders may reflect the hybrid
540 characteristics of this position, marked by both defensive and offensive requirements. In fact,
541 midfielders occupy centralized positions, where there is great visibility to teammates and
542 coaches, and the access to information is maximized (Di Salvo et al., 2007). Overall, applied
543 interventions geared at helping players understand and gain knowledge of their teammates'
544 perspective and positional demands should include (a) encouraging players to switch positions
545 during practice, and (b) team discussions on the demands, similarities and idiosyncrasies of each
546 position are warranted.

547 **Team Socio-Cognitive Factors**

548 **Cohesion.** Perceptions of team social (and not task) cohesion contributed to the
549 predictive value of the model. Noteworthy, in Carron et al.'s (2002) meta-analysis similar results
550 were found, where the relationship was stronger between performance and social cohesion ($d =$
551 $.70$) compared to task cohesion ($d = .61$). Perception of team task cohesion did not differ among
552 teams and individual players probably because all the teams were high-ranked and qualified for
553 the tournament play-offs. Additionally, players were focused on the task and on the preparations
554 for the tournament, which could have also eliminated task differences among teams. Indeed,
555 clear goal and roles are essential to team productivity, and high-performing teams are usually
556 strong about their direction and task assignments (Carron et al., 2007; Eccles & Tenenbaum,
557 2004). With all high-ranked teams possessing clear tasks and goals, positive affect and a mutual
558 accountability support network may be a better discriminant of team performance. Accordingly,
559 social rather than task related factors may represent a competitive edge, further energizing the

560 interactions and performance of top-ranked teams. Of note, these findings mirror research in the
561 business domain in which developing social cohesion is a priority of large companies and world
562 class CEOs (e.g., Google, Nokia). Specifically, transnational companies invest in areas for social
563 interaction within their companies (e.g., workout facilities, restaurants, break areas), as well as
564 numerous socialization and network building practices outside the work environment (e.g.,
565 outreach programs, volunteer opportunities) (Gratton & Erickson, 2007). These efforts
566 collectively aim to foster strong social relationships, developing the mutual trust needed to
567 promote innovation and improve efficiency. Therefore, it is the social aspect that makes critical
568 performance differences when working team members are clear on their task responsibilities.

569 **Team mental models (TMM).** Team mental models have only recently been studied in
570 the sport environment (Eccles & Tran, 2012). Thus, the inclusion of TMM components to
571 explore sport team settings was relatively innovative. Notwithstanding, the lack of predictive
572 power of TMM sub-components (i.e., general task and team knowledge, general task and
573 communication skills, attitudes towards group teammates and task, team dynamics and
574 interactions, and team resources and working environment) does not necessarily mean that
575 performance of elite soccer teams is not linked to TMM. Instead, it is likely that these results
576 reflect a “ceiling-effect” given that expert teams are all characterized by optimal implicit and
577 explicit coordination dynamics. Hence, rather than focus on high-ranked teams only, future
578 studies may (a) consider a different paradigm (expert-novice approach) in comparing bottom to
579 top ranked teams, and (b) accompany the evolution of TMM through developmental approaches
580 and longitudinal growth-models. Future studies should also focus on developing sport specific
581 TMM measurement tools, which may be used to capture and eventually develop intervention
582 programs aimed at improving team performance.

583 **Conclusions, Limitations and Future Avenues**

584 This study advanced knowledge on team expertise by assessing both individual and team-
585 level properties associated with subjective accounts of team performance. First, we learned that
586 task-related and TMM factors did not discriminate among high-performing teams. Hence, social
587 rather than task related and TMM factors may represent a competitive edge among top-ranked
588 teams. Second, we encourage coaches and practitioners to be sensitive to cultural differences, as
589 “locals” and international players are likely to differ in performance expectations. Lastly, players
590 from different field positions related differently to team performance. Hence, team discussions
591 on the similarities and idiosyncrasies of each team role may be beneficial to enhance collective
592 performance.

593 From a theoretical standpoint, these findings reinforce the importance of testing for the
594 specific effects of task and social cohesion on team performance (Carron et al., 1985; Eys et al.,
595 2007). Individuals from different competitive backgrounds (e.g., recreational, collegiate,
596 professional) may have different social and task attractions to their social groups (Carron et al.,
597 2007). Moreover, these findings corroborate the assumption that members’ demographic and role
598 attributes should be accounted for when studying the linkage between team processes (cohesion,
599 TMM) and performance in sports (Carron et al., 2007; Eccles & Tenenbaum, 2004).

600 The results of this study are not without limitations. In particular, results are limited in
601 scope, in the sense that not all team-level constructs (e.g., collective-efficacy, leadership,
602 communication) were entered in the HLM model. Results are also limited in terms of
603 generalizability, as our target sample was restricted to high-ranked college soccer teams. The
604 lack of a TMM sport specific measurement tool (at the time of the study) is also noteworthy. The
605 reliance on regression coefficients constitutes an exploratory rather than a confirmatory or

606 experimental approach, and thus the results presented herein are neither definitive nor causal in
607 nature. Also noteworthy, the low reliability values found for the ATG-T measure were somewhat
608 surprising given the players competed at a high level (i.e., US College), and as such individual
609 perceptions towards the task were expected to be higher. In this regard, it is been proposed that
610 skilled athletes perceive their individual contributions to the team in a highly idiosyncratic
611 manner, and consequently nomothetic psychometric measures may not fully (and reliably)
612 capture their experiences (Hanin, 2007). [Future studies should consider using updated
613 psychometric instruments, as well as qualitative methods, in measuring ones' self-perceptions
614 and meta-cognitive experiences.](#)

615 In view of these limitations, future studies should consider different team-level constructs
616 (e.g., collective-efficacy, leadership) and be grounded in a distinct theoretical orientation (e.g.,
617 dynamic systems perspective). Targeting different sub-population groups and developing sport
618 specific measurement tools, as particularly related to TMM, are also avenues for future research.
619 Specifically, sport psychologists should critically analyze which non-sport latent constructs are
620 relevant (i.e., the theoretical and applied concepts, derived from non-sport team building
621 research, relevant to sport and exercise psychologists) and should be operationalized through the
622 development of sport specific measurement tools (see Brawley & Paskevitch, 1997). Finally,
623 experimental trials and longitudinal studies are welcomed to identify causal links and the
624 developmental nature of high-performing teams, respectively.

625 References

- 626 Basevitch, I., Ward, P., Ericsson, A. K., Ehrlinger, J., & Medeiros, F. E. (2010). Practice habits,
627 self-beliefs, self-evaluation and soccer skill level. *Journal of Sport & Exercise*
628 *Psychology*, 32, S57-S58.
- 629 Brawley, L. R., Carron, A. V., & Widmeyer, W. N. (1992). The nature of group goals in sport
630 teams: A phenomenological analysis. *The Sport Psychologist*, 6, 323-333.
631 <http://search.proquest.com/docview/618289082?accountid=4840>
- 632 Cahill, L. (2005, May). His brain, her brain. *Scientific American*, 292, 40-47.
- 633 Carey, D. P., Smith, G., Smith, D. T., Shepherd, J. W., Skriver, J., Ord, L., & Rutland, A. (2001).
634 Footedness in world soccer: an analysis of France '98. *Journal of Sports Sciences*, 19,
635 855-864.
- 636 Carless, S. A., & De Paola, C. (2000). The measurement of cohesion in work teams. *Small*
637 *Group Research*, 31, 71-88. doi:10.1177/104649640003100104
- 638 Carron, A. V., Brawley, L. R., & Widmeyer, W. N. (1998). Measurement of cohesion in sport
639 and exercise. In J. L. Duda (Ed.). *Advances in sport and exercise psychology*
640 *measurement* (pp. 213-226). Morgantown, WV: Fitness Information Technology.
- 641 Carron, A. V., Widmeyer, W. N., & Brawley, L. R. (1985). The development of an instrument to
642 assess cohesion in sport teams: The group environment questionnaire. *Journal of Sport*
643 *Psychology*, 7, 244-266.
- 644 Carron, A. V., Colman, M. M., Wheeler, J., & Stevens, D. (2002). Cohesion and performance in
645 sport: A meta-analysis. *Journal of Sport & Exercise Psychology*, 24, 168-188.

- 646 Carron, A. V., Eys, M. A., & Burke, S. M. (2007). Team cohesion: Nature, correlates, and
647 development. In S. Jowette, & D. Lavalley (Eds.). *Social Psychology in Sport* (pp.91-
648 102). Champaign, IL: Human Kinetics.
- 649 Carron, A. V., & Hausenblas, H. A. (1998) *Group dynamics in sport* (2nd ed.). Morgantown,
650 WV: Fitness Information technology.
- 651 Cooke, N. J., Salas, E., Cannon-Bowers, J., & Stout, R. J. (2000). Measuring team knowledge.
652 *Human Factors*, 42, 151-173. doi:10.1518/001872000779656561
- 653 Chelladurai, P. (2007). Leadership in Sports. In G. Tenenbaum & R. C. Eklund (Eds.),
654 *Handbook of sport psychology* (3rd ed., pp. 113-135). New Jersey: John Wiley & Sons.
- 655 Coleman, J. (2012). A functional model of team leadership for sport. The Florida State
656 University). ProQuest Dissertations and Theses, 136. Retrieved from
657 <http://search.proquest.com>
- 658 Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative
659 and qualitative research*. Newark, NJ: Pearson.
- 660 Di Salvo, V., Baron, R., Tschan, H., Calderon Montero, F. J., Bachl, N., & Pigozzi, F. (2007).
661 Performance characteristics according to playing position in elite soccer. *International
662 journal of sports medicine*, 28, 222.
- 663 Eccles, D. (2010). The coordination of labour in sports teams. *International Review of Sport and
664 Exercise Psychology*, 3, 154-170. doi:10.1080/1750984X.2010.519400
- 665 Eccles, D. W., & Tenenbaum, G. (2004). Why an expert team is more than a team of experts: A
666 social-cognitive conceptualization of team coordination and communication in sport.
667 *Journal of Sport & Exercise Psychology*, 26, 542-560.

- 668 Eccles, D. W., & Tran, K. B. (2012). Getting them on the same page: Strategies for enhancing
669 coordination and communication in sports teams. *Journal of Sport Psychology in
670 Action, 3*, 30-40. doi:<http://dx.doi.org/10.1080/21520704.2011.649229>
- 671 Entin, E. E., & Serfaty, D. (1999). Adaptive team coordination. *Human Factors, 41*, 312-325.
672 doi:10.1518/001872099779591196
- 673 Eys, M. A., Carron, A. V., Bray, S. R., & Brawley, L. R. (2007). Item wording and internal
674 consistency of a measure of cohesion: The group environment questionnaire. *Journal of
675 Sport & Exercise Psychology, 29*, 395-402.
- 676 Filho, E. M., Gershgoren, L., Basevitch, I., Schinke, R., & Tenenbaum, G. (In press). Peer
677 leadership and shared mental models in a college volleyball team: A season long case
678 study. *Journal of Clinical Sport Psychology*.
- 679 Frith, C. (2008). Social cognition. *Philosophical Transactions of the Royal Society B, 363*, 2033-
680 2039.
- 681 Gratton, L., & Erickson, T. J. (2007). 8 Ways to Build Collaborative Teams. *Harvard Business
682 Review, 85*, 100-109.
- 683 Hanin, Y. L. (2007). Emotions in sport: Current issues and perspectives. In G. Tenenbaum & R.
684 Eklund (Eds.), *Handbook of sport psychology* (3rd ed., pp. 31-58). Hoboken, NJ: Wiley.
- 685 Hill, B., & Green, B. C. (2008) Give the bench the boot! Using Manning Theory to design youth-
686 sport programs. *Journal of Sport Management, 22*, 184-204.
- 687 Jeffery-Tosoni, S., Eys, M. A., Schinke, R. J., & Lewko, J. (2011). Youth sport status and
688 perceptions of satisfaction and cohesion. *Journal of Sport Behavior, 34*, 150-159.
- 689 Johnson, T. E., Lee, Y., Lee, M., OConnor, D. L., Khalil, M. K., & Huang, X. (2007). Measuring
690 sharedness of team-related knowledge: Design and validation of a shared mental model

- 691 instrument. *Human Resource Development International*, 10, 437-454.
692 doi:10.1080/13678860701723802
- 693 Kamata, A., Tenenbaum, G., & Hanin, Y. L. (2002). Individual zone of optimal functioning
694 (IZOF): A probabilistic estimation. *Journal of Sport & Exercise Psychology*, 24, 189-208.
- 695 Katzenbach Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J.
696 (2000). The influence of shared mental models on team process and performance. *Journal*
697 *of Applied Psychology*, 85, 273-283. doi:10.1037/0021-9010.85.2.273
- 698 Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. (2000). The
699 influence of shared mental models on team process and performance. *Journal of Applied*
700 *Psychology*, 85, 273-283. doi:10.1037/0021-9010.85.2.273
- 701 Mohammed, S., Ferzandi, L., & Hamilton, K. (2010). Metaphor no more: A 15-year review of
702 the team mental model construct. *Journal of Management*, 36, 876-910.
703 doi:10.1177/0149206309356804
- 704 Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and performance: An
705 integration. *Psychological Bulletin*, 115, 210-227. doi:10.1037/0033-2909.115.2.210
- 706 Popp, N., Hums, M. A., & Greenwell, T.C. (2010). A comparison of international and domestic
707 student-athletes: Measuring social adjustment and institutional attachment to
708 college. *International Journal of Sport Management*, 11, 329-346.
- 709 Raab, M., & Johnson, J. G. (2007). Expertise-based differences in search and option generation
710 strategies. *Journal of Experimental Psychology: Applied*, 13, 158-170.
- 711 Raudenbush, S. W., & Bryk, A.S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks,
712 CA: Sage Publications.

- 713 Salas, E., Rosen, M. A., Burke, C. S., Goodwin, G. F., & Fiore, S. (2006). The making of a
714 dream team: When expert teams do best. In K. A. Ericsson, N. Charness, P. J. Feltovich
715 & R. R. Hoffman (Eds.), *The cambridge handbook of expertise and expert performance*
716 (pp. 439-453). New York, NY: Cambridge University Press.
- 717 Stumpf, S. A., Doh, J. P., & Tymon, W. (2010). The Strength of HR Practices in India and Their
718 Effects on Employee Career Success, Performance, and Potential. *Human Resource*
719 *Management, 49*, 353-375.
- 720 Ward, P., & Eccles, D. W. (2006). A commentary on "team cognition and expert teams:
721 Emerging insights into performance for exceptional teams." *International Journal of*
722 *Sport and Exercise Psychology, 4*, 463-483. doi:10.1080/1612197X.2006.9671808
- 723 Watt, S. K., & Moore, J. L. (2001). Who are student athletes? *New Directions for Student*
724 *Services, 93*, 7-18.
- 725 Widmeyer, W. N., Brawley, L. R., & Carron, A. V. (1985). The measurement of cohesion in
726 sport teams: *The group environment questionnaire*. London, CA: Sports Dynamics.
- 727 Wood, C. J., & Aggleton, J. P. (1989). Handedness in fast ball sports: do left-handers have an
728 innate advantage? *British Journal of Psychology, 80*, 227-240.

Table 1

Descriptive Statistics and Reliability Estimates for the GEQ and TADM

<i>Scale</i>	<i>Descriptive Statistics</i>			
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>Alpha</i>
<i>GEQ</i>				
ATG-S ^a	7.29	1.45	1.2-9	.63
ATG-T ^b	6.96	1.59	2-9	.56
GI-S ^c	6.71	1.25	1.25-9	.72
GI-T ^d	6.80	1.44	2-9	.75
Total GEQ	6.94	1.17	2.79-9	.84
<i>TADM</i>				
GTTK ^e	4.23	.56	2-5	.75
GTC ^f	3.84	.68	1.67-5	.84
GTT ^g	4.14	.63	1.33-5	.77
TDI ^h	3.89	.65	2-5	.81
TRWE ⁱ	3.99	.64	1.33-5	.77
Total TADM	4.02	.53	2.20-5	.93
<i>TOQ</i>	77.78	82.25	22-100	.89

Note.: ^a Individual Attraction to the Group-Social. ^b Individual Attraction to the Group-Task. ^c Group Integration-Social. ^d Group Integration Task. ^e General Task and Team Knowledge. ^f General Task and Communication. ^g Attitudes Towards Group Teammates and Task. ^h Team Dynamics Interactions. ⁱ Team Resources and Working Environment.

Table 2

Matrix Correlation among GEQ, TADM and TOQ

	ATG-S	ATG-T	GI-S	GI-T	GTTK	GTC	GTT	TDI	TRWE	TOQ
ATG-S ^a		.47**	.51**	.49**	.27**	.39**	.41**	.46**	.44**	.31**
ATG-T ^b			.23**	.45**	.25**	.35**	.34**	.38**	.41**	.34**
GI-S ^c				.57**	.36**	.47**	.52**	.54**	.51**	.36**
GI-T ^d					.49**	.60**	.62**	.63**	.63**	.54**
GTTK ^e						.53**	.52**	.59**	.54**	.50**
GTC ^f							.60**	.69**	.66**	.53**
GTT ^g								.69**	.65**	.48**
TDI ^h									.76**	.53**
TRWE ⁱ										.55**

Note.: ^a Individual Attraction to the Group-Social. ^b Individual Attraction to the Group-Task. ^c Group Integration-Social. ^d Group Integration Task. ^e General Task and Team Knowledge. ^f General Task and Communication. ^g Attitudes Towards Group Teammates and Task. ^h Team Dynamics Interactions. ⁱ Team Resources and Working Environment.

Table 3

Multilevel Regression Estimates for Model 1A

Fixed Effect	Coefficient	SE	t-Ratio	p-value
Intercept, γ_{00}	67.16	10.27	6.54	< 0.01
Gender, γ_{10}	6.09	3.71	1.64	.10
Nationality, γ_{20}	-4.17	1.77	-2.35	.02
Laterality, γ_{30}	0.14	1.45	0.09	.92
Starter, γ_{40}	-1.67	1.35	-1.24	.22
Freshman, γ_{50}	4.36	8.48	0.51	.61
Sophomore, γ_{60}	6.30	8.53	0.74	.46
Junior, γ_{70}	3.38	8.47	0.40	.69
Senior, γ_{80}	2.06	8.49	0.24	0.81
Goalkeeper, γ_{90}	11.82	5.60	2.11	.04
Defense, γ_{100}	12.53	5.40	2.32	.02
Midfielder, γ_{110}	7.39	5.37	1.38	0.17
Offense, γ_{120}	12.56	5.42	2.32	.02
<u>Random Effect</u>	Variance	df	χ^2	p-value
Intercept, u_0	49.53	16	128.79	<.01
Level-1 effect, r_{ij}	127.02			

Table 4

Multilevel Regression Estimates for Model 1B

Fixed Effect	Coefficient	SE	t-Ratio	p-value	Sig.
Intercept, γ_{00}	80.44	2.10	38.36	<.01	**
Nationality, γ_{20}	-4.09	1.709	-2.40	.02	*
Goalkeeper, γ_{30}	4.50	2.16	2.08	.04	*
Defense, γ_{40}	5.23	1.53	3.42	<.01	**
Offense, γ_{50}	5.38	1.69	3.18	<.01	**
<u>Random Effect</u>	Variance	df	χ^2	p-value	
Intercept, u_0	50.98	16	137.77	<.01	**
Level-1 effect, r_{ij}	128.05				

Table 5

Multilevel Regression Estimates for Model 2 (Final)

Fixed Effect	Coefficient	SE	t-Ratio	p-value
Intercept, γ_{00}	54.26	8.6564	6.23	<.01
GI-S_MEAN, γ_{01}	3.88	1.09	3.56	<.01
Nationality, γ_{10}	-3.93	1.40	-2.81	<.01
Goalkeeper, γ_{20}	4.61	2.38	1.93	.05
Defense, γ_{30}	5.19	1.339	3.88	<.01
Offense, γ_{40}	5.43	1.90	2.85	<.01
<u>Random Effect</u>	Variance	df	χ^2	p-value
Intercept, u_0	38.89	15	97.22	<.01
Level-1 effect, r_{ij}	128.17			

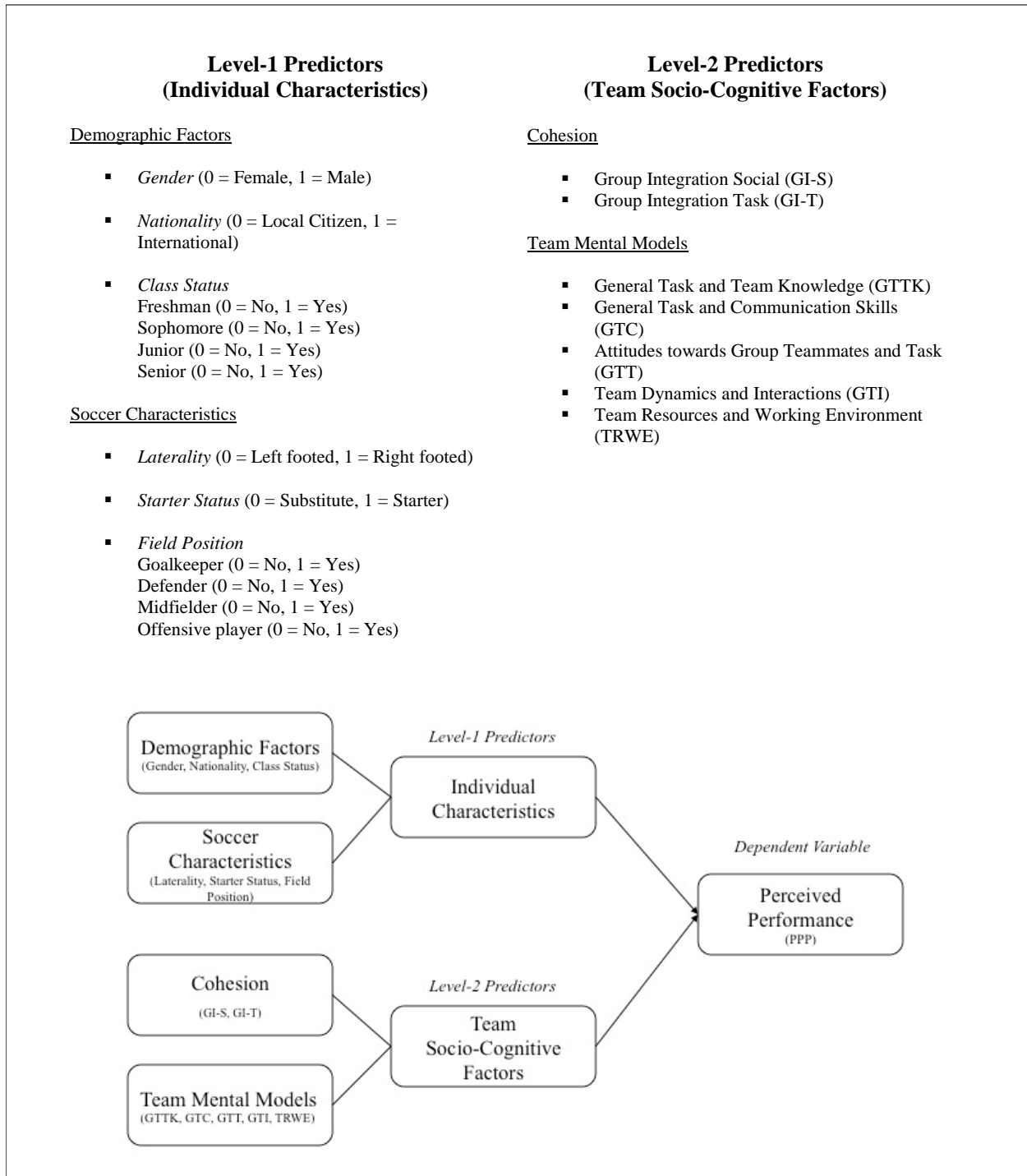


Figure 1. Definition and Representation of the Variable Considered in the Multilevel Equation.