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5   Head Title: ANGER PROFILES

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7   Perceived anger profiles in table tennis players: Relationship with athlete burnout symptoms

8   and coping

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26   Abstract

27   Objectives: This study aimed to identify dispositional anger profiles in table-tennis players and

28   examine whether participants from distinct profiles significantly differed on athlete burnout

29   symptoms and coping.

30   Design: A quantitative cross-sectional design was used in the present study.

31   Method: A sample of 244 table tennis players (M_{age} = 31.29; SD = 9.72) completed a series of

32   self-report questionnaires designed to assess anger (the State-Trait Anger Expression Inventory;

33   STAXI-2), coping (the Coping Inventory for Competitive Sport; CICS) and athlete burnout

34   symptoms (the Athlete Burnout Questionnaire; ABQ).

35   Results: Three-profile solution showed best fit to data, to analyse them LPA models were run

36   by first testing a one-class model and then exploring models with more classes in order to

37   identify the anger profiles: The anger profiles were labelled as: (a) High anger profile

38   comprising players with moderate scores of temperament, external expression, external control,

39   reaction and high scores, internal expression and control (n = 91); (b) Overwhelmed anger

40   profile comprising players with high scores on temperament, reaction, internal and external

41   expression, and low scores of internal and external control (n = 13); and (c) Low anger profile

42   comprising players with low levels of temperament, reaction, internal and external expression

43   and high levels of internal and external control (n = 140). Results of BCH method revealed

44   significant differences across profiles in athlete burnout symptoms and coping. In particular,

45   table-tennis players from the high anger profile reported significant higher scores of physical

46   and emotional exhaustion, sport devaluation, reduced sense of accomplishment, resignation,

47   distancing and venting emotions than players belonging to the low anger profile.

48   Conclusions: Three different anger profiles among table-tennis players emerged from the

49   cluster analyses. Players from the overwhelmed anger profile were characterized by the worst

50   psychological adjustment based on their scores of coping and athlete burnout symptoms. Thus,

51   it would be interesting to develop empirically proven interventions designed to help such

52   athletes modify their maladaptive anger profile in order to maximize their psychological

53   adjustment to the inherent demands of table-tennis.

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55   *Keywords: anger management, athlete burnout, cluster analysis, coping, emotion.*

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58   Perceived anger profiles in table tennis players: Relationship with burnout and coping

59   Several scholars have highlighted the salient influence of anger on athletes' performance

60   in the sporting context (Davis, 2011; González-García, Pelegrín & Trinidad, 2019; Martinent

61   & Ferrand, 2009; Robazza & Bortoli, 2007; Steffgen, 2017). Anger can increase or decrease

62   performance depending on the characteristics of the sport, the athlete's way of handling that

63   emotion and the environmental variables (contextual factors of task) (Davis, Woodman &

64   Callow, 2010; Martinent & Ferrand, 2009; Robazza & Bortoli, 2007; Ruiz & Hanin, 2011). For

65   instance, in contact sports (strength tasks characterised by a somewhat low fine skills

66   component), anger can enhance sporting performance (Davis, 2011; Davis et al., 2010; Robazza

67   & Bortoli, 2007), whereas, in sports involving fine skills (e.g. racket sports), anger can lead to

68   a worsening of performance, due to the difficulty in controlling this emotion and the fine

69   technical skills required by the sport (Davis, 2011; Davis et al., 2010; Martinent & Ferrand,

70   2009; Martinent, Campo & Ferrand, 2012). For that reason, several investigations have studied

71   the impact of anger in table tennis players (González-García et al., 2019; Martinent et al., 2012;

72   Martinent & Ferrand, 2009). Martinent and collaborators (Martinent & Ferrand, 2009;

73   Martinent et al., 2012) found that anger and anxiety were the most difficult emotions to handle

74   in table tennis players. Moreover, some studies showed that high anger levels were experienced

75   by amateur table-tennis players but not professional and international ones (González-García et

76   al., 2019; Menéndez-Santurio & Fernández-Río, 2015).

77   Despite controversies around the definition of emotions, because emotions are

78   considered shorter than moods and are a response to a stimulus (Gross, 1998; Hanin, 2007;

79   Lazarus, 2000), anger can be conceptualized as an emotion (including a facial expression

80   component; Ekman, 1984; Frijda, 1986; Izard, 1977) that evokes an alert state and can provoke

81   aggression (Deffenbacher & McKay, 2000; Lench, 2004). Anger can be experienced as a state

82   or can be conceptualised as a personality trait (Spielberger, Miguel-Tobal, Casado & Cano-

83   Vindel, 2001). If it is experienced as a state, it means that the feeling of anger is triggered by a

84   situation of increasing anger levels (Davis, 2011; Hanin, 2007; Spielberg et al., 2001).

85   Otherwise, a person can frequently feel anger in a number of situations (trait anger) (Davis,

86   2011; Hanin, 2007; Spielberg et al., 2001). In line with Spielberg et al. (2001), the anger trait

87   can be conceptualised as a multidimensional concept including temperament (anger quickly

88   experienced with little provocation), reaction (the tendency to become angry or agitated when

89   the respondent is criticized, receives negative feedback, or believes he/she is being treated

90   badly), internal anger expression (individual holds things in or suppresses anger when he/she is

91   angry or furious), external anger expression (a person expresses his/her emotional experience

92   of anger in an outwardly negative and poorly controlled manner), internal anger control (how

93   often a person's tendency to relax, calm down and reduce angry feelings before they get out of

94   control) and external anger control (the expenditure of energy to monitor and control the

95   physical or verbal expressions of anger). Since the aim of the present study was to identify

96   anger profiles in table-tennis players, we focused on dispositional anger (trait anger). This

97   choice was based on the rationale that the effects of dispositional anger profiles would

98   potentially be more salient than the effects of state anger profiles, as dispositional anger profiles

99   were representative of participants' anger experience in a number of situations (Deffenbacher

100 & McKay, 2000; Spielberg et al., 2001).

101   As a whole, the literature on anger in sport is mainly focused on bivariate relationships

102 between anger and some other variables (Robazza & Bortoli, 2007; Steffgen, 2017). For

103 example, previous research showed that higher anger levels were significantly related to

104 disengagement-oriented coping (Diong et al., 2007) and higher external and internal anger

105 control were related to more positive coping strategies (Casado & Franco, 2010). This approach

106 has neglected the multivariate nature of the dispositional anger construct. However, the various

107 dimensions of the dispositional anger construct could operate in conjunction with each other

108   based on the rationale that the effect of a particular anger component can depend on the scores

109   of other anger components. Thus, much information might be lost if dispositional anger

110   dimensions are examined discretely and in isolation from one another, as this does not

111   encompass the systemic nature of the anger construct (interplay among dispositional anger

112   dimensions). As such, identifying distinct profiles of athletes based on the various dispositional

113   anger dimensions might provide new insights on the anger construct. In this perspective,

114   person-centred approaches (e.g. latent profile analysis) describe differences among individuals

115   in how the several dispositional anger dimensions are related to each other and could further

116   the literature on anger in sport (Ichiro, 2012). Moreover, multivariate anger profiles could offer

117   a promising platform to examine not only the different combinations of anger dimensions that

118   exist in real-world settings but also their complex interplay with salient psychological variables

119   (athlete burnout and coping). Athlete burnout and coping were selected because they seem

120   particularly poignant for competitive table tennis players (González-García & Martinent, 2019),

121   and they have a direct impact on performance in table-tennis (Martinent, Cece, Elferink-

122   Gemser, Faber, & Decret, 2018).

123   Lazarus' (2000) Cognitive-Motivational-Relational Theory (CMRT) is one of the

124   emotion theories most used in sport settings. CMRT points out that the emotions experienced

125   (e.g. anger) and coping strategies used by athletes depend on the way the athletes evaluate

126   events and situations that occur in competition (appraisals) (Lazarus, 2000; Lazarus & Folkman,

127   1984; Martinent & Ferrand, 2015). Coping strategies can be defined as athletes' cognitive and

128   behavioural efforts implemented to control the internal and/or external demands evaluated as

129   exceeding their perceived resources (Lazarus & Folkman, 1984). Congruent with findings that

130   individual coping strategies can be assigned to different macro dimensions of coping (e.g.

131   Lazarus & Folkman, 1984; Skinner, Edge, Altman, & Sherwood, 2003), Gaudreau and

132   collaborators (Gaudreau & Blondin, 2002; Nicolas, Gaudreau & Franche, 2011) identified three

133   coping dimensions in the context of sporting competition: Task-oriented coping (strategies

134   aimed at dealing directly with the stressful situation and the resulting thoughts and affects) such

135   as logical analysis, imagery/thought control or social support; disengagement-oriented coping

136   (strategies through which a person withdraws from the process of actively striving toward the

137   realization of desirable outcomes) such as resignation or venting emotions; distraction-oriented

138   coping (strategies used to momentarily focus attention on external and internal stimuli unrelated

139   to the stressful situation) such as distancing or mental distraction. Within the context of table

140   tennis, some studies pointed out that task-oriented coping led to better performance outcomes

141   (Kurimay, Pope-Rhodius, Kondric, 2017; Martinent & Decret, 2015). In line with these

142   outcomes, Doron and Martinent (2016) provided evidence in a dual sport (fencing) that task-

143   oriented coping was related to challenge appraisal, positive emotions and performance, whereas

144   disengagement-oriented coping was linked with threat appraisal and negative emotions.

145   Concerning previous studies examining the anger-coping relationship, Bolgar, Janelles and

146   Giacobbi (2006) revealed that tennis players reporting the greatest trait-anger levels were those

147   who used the most problem and emotion-focused coping strategies (task-oriented coping).

148   Likewise, Steffgen (2017) designed an intervention to reduce trait-anger in table tennis players,

149   and after one year the intervention group reported reductions in trait-anger levels and

150   improvements in coping skills. As such, this study provided further indirect evidence for the

151   positive relationship between anger and coping among table-tennis players.

152   Growing empirical research has provided evidence that athlete burnout can be defined

153   as a syndrome characterized by physical/emotional exhaustion, sport devaluation, and a reduced

154   sense of accomplishment (Martinent, Louvet & Decret, in press; Raedeke, 1997; Raedeke &

155   Smith, 2001). Athlete burnout can be conceptualized as a response to chronic demands that

156   exceeds the athlete's resources (Raedeke, 1997). Athlete burnout was related to a bulk of

157   negative sport outcomes, such as drop out, decreased performance, lack of enthusiasm or loss

158   of social cohesion (Fletcher, Hanton & Wagstaff, 2012; Martinent et al., 2018; Nicholls &

159   Polman, 2007). For instance, athlete burnout is one of the leading factors of dropout among

160   table tennis players (Martinent et al., 2018, in press; Martinent, Decret, Guillet-Descas &

161   Isoard-Gautheur, 2014). Of particular importance in the context of the present study, previous

162   research has suggested that unpleasant emotions (such as anger) are related to emotional

163   exhaustion (Lee, Hyungil, Andrew & Richards, 2018). Identifying anger profiles in table tennis

164   players could reveal which players are particularly at risk for developing athlete burnout

165   symptoms. Such information could ultimately be especially valuable for researchers and sport

166   psychologists for implementing practical interventions designed to prevent athlete burnout

167   symptoms.

168   As a whole, examination of anger profiles could go further in our understanding of how

169   the several dimensions of trait anger may operate. In turn, this could help practitioners to adapt

170   their intervention according to the needs of specific groups of athletes. Thus, this study aimed

171   to identify dispositional anger profiles among a sample of table tennis players. We also

172   examined whether participants with distinct anger profiles significantly differed on athlete

173   burnout and coping. It was deemed premature to formulate specific hypotheses regarding the

174   number or characteristics of anger profiles because of the lack of studies grounded within an

175   anger profile approach. Nevertheless, on the basis of existing research (Kurimay et al., 2017;

176   Lee et al., 2018; Martinent & Decret, 2015; Steffgen, 2017), we broadly hypothesized that: (a)

177   anger profiles characterized by high temperament, low internal control and external control and

178   high external and internal anger expression will be characterized by higher levels of athlete

179   burnout, distraction-oriented and task-oriented coping; (b) anger profiles characterized by low

180   temperament, high anger internal and external control and low external and internal anger

181   expression will be characterized by lower levels of athlete burnout and disengagement-oriented

182   coping.

183 Method

184 Design and Procedure

185   The research was carried out following international APA ethical guidelines,

186 Declaration of Helsinki and Spanish ethical guidelines, and anonymity was preserved. The

187 study followed a cross-sectional design in which researchers tried to collect participants from

188 all Spanish regions. The data of the sample collection was from January 2018 to June 2018. In

189 line with this, the Spanish table tennis federation was contacted by researchers to request an

190 announcement be placed on their website calling for participation in the study. Once

191 participants accessed the announcement, players interested in participating completed the

192 online survey. First, they signed an informed consent form and then they could begin to answer

193 the survey questions. The full survey took thirty minutes and during the form-filling process,

194 they had to respond to the acquiescence questions of the Oviedo scale of infrequency response

195 (Fonseca-Pedrero, Lemos-Giráldez, Paino, Villazón-García, & Muñiz, 2009). This requirement

196 was only to ensure that participants were focused on the task and responded honestly. Finally,

197 in data collection around 527 players signed the informed consent, but only 244 players finished

198 the whole questionnaire, which provided the final sample.

199

200 Participants

201   The sample was made up of 244 table tennis players (M_{age} = 31.29; SD = 9.72; 181 men

202 and 63 women). Regarding participants, 24 were professionals (9.8%) and 220 were amateurs

203 (90.2%). In terms of sport success, 62 reached national successes (25.4%) and 21 reached

204 international successes (8.6%). Concerning the time of sport practice per week, 50 players

205 practised 0-5 hours (20.5%), 89 practised 5-10 hours (36.5%), 63 practised 10-15 hours

206 (25.8%), 31 practised 15-20 hours (12.7%) and 11 practised more than 20 hours (4.5%).

207   Selected inclusion criteria were: table tennis players, aged over 18 years and members

208   of the Spanish federation.

209   Measures

210   Anger was assessed through the Spanish version (Miguel-Tobal, Cano-Vindel, Casado

211   & Spielberger, 2001) of State-Trait Anger Expression Inventory (STAXI-2) (Spielberger et al.,

212   2001). The STAXI-2 is a 49-item survey that measures the intensity of anger as an emotional

213   state (state anger; 15 items) and the tendency to experience angry feelings as a personality trait

214   (trait anger; 34 items). In the present work, we only used the trait anger scale which comprised

215   external anger expression (6 items), internal anger expression (6 items), temperament (5 items),

216   anger reaction (5 items), internal anger control (6 items) and external anger control (6 items)

217   using a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). To cite

218   examples of some items: "I feel annoyed when I do not get recognition in sport"; "I control my

219   temper when I am competing or training". The instructions of STAXI-2 were slightly modified

220   to focus on the sporting context (González-García et al., 2019). Previous studies provided

221   evidence for the validity and reliability of the trait anger scale scores (González-García et al.,

222   2019; Miguel-Toba et al., 2001; Spielberger et al., 2001). In the present study, Cronbach alphas

223   provided evidence for acceptable reliability of scores for temperament ($\alpha = .83$), reaction ($\alpha =$

224   .81), internal anger control ($\alpha = .83$), external anger control ($\alpha = .75$), internal anger expression

225   ($\alpha = .67$) and external anger expression ($\alpha = .75$).

226   The Spanish version (Molinero, Salguero, & Márquez, 2010) of the Coping Inventory

227   for Competitive Sport (CICS; Gaudreau & Blondin, 2002) was used to measure coping skills

228   in table tennis players. This scale contains 31 items using a 5-point Likert-type scale ranging

229   from 1 (not at all) to 5 (very much) (e.g. I tried to relax my body). Previous research provided

230   evidence for the reliability and validity of Spanish CICS scores (González-García et al., 2019;

231   Molinero et al., 2010). The scale is divided in 8 factors: resignation (4 items; $\alpha = .73$), relaxation

232   (4 items; α = .74), distancing (3 items; α = .43), logical analysis (7 items; α = .61), seeking

233   support (2 items; α = .83), imagery/thought control (5 items; α = .64), venting emotions (3

234   items; α = .78) and mental distraction (3 items; α = .73).

235   The Spanish version (Arce, De Francisco, Andrade, Seoane, & Raedeke, 2012) of the

236   Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) was used to evaluate athlete

237   burnout symptoms. It is made up of three subscales that measure emotional/physical exhaustion

238   (5 items), sport devaluation (5 items), and reduced accomplishment (5 items). Participants

239   responded using a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always)

240   (e.g. "I believe I am not as interested in sport as I was"). Previous research provided evidence

241   for the validity and reliability of the scores derived from the ABQ (Arce et al., 2012; González-

242   García, Martinent, & Trinidad, 2019; Isoard-Gautheur, Oger, Guillet, & Martin-Krumm, 2010).

243   The Cronbach alphas were of 0.84 for emotional/physical exhaustion, 0.63 for reduced

244   accomplishment and 0.78 for sport devaluation and provided evidence for acceptable reliability

245   of ABQ factor scores.

246   The INF-OV was used (Fonseca-Pedrero et al., 2009) to identify acquiescence and

247   dishonest participants. This is a 12-item self-report measure with a 5-point Likert-type rating

248   scale format ranging from 1 (totally disagree) to 5 (totally agree). Its goal is to detect

249   participants who responded randomly, pseudo-randomly or dishonestly on self-reports (e.g.

250   "The distance between Madrid and Barcelona is greater than between Madrid and New York")

251   (González-García, Pelegrín, & Carballo, 2018). The participants with more than 4 incorrect

252   answers were deleted from the sample. In this study, 10 participants were taken out of the

253   sample. In addition, previous studies presented the accuracy of this scale in the detection of

254   dishonest participants (González-García et al., 2019).

255   Data Analyses

256   Statistical analyses were conducted using M plus version 7.3 (Muthén & Muthén, 2012).

257 To test the hypotheses, we used a Latent Profile Analysis (LPA) approach. LPA is a multivariate

258 statistical model which posits that an underlying grouping variable (e.g. anger profile) is not

259 observed but can be inferred from a set of indicators (Martinent & Nicolas, 2017). Firstly, to

260 identify the model that best fits the selection of the different anger profiles, a series of

261 measurement models was performed to determine which model is the best fit (Martinent &

262 Nicolas, 2016). Specifically, LPA models are grounded in a series of modelling steps, starting

263 with the specification of a one-class model. The number of classes is then increased until there

264 is no further improvement of the model, since adding another class would result in meaningless

265 classes (Martinent & Nicolas, 2016). In LPA models, several statistical indicators are used to

266 assess the model fit to the data. As such, a combination of statistical indicators was used to

267 decide which model fit the best: log likelihood value, Akaike information criterion (AIC;

268 Akaike, 1987), Bayesian information criterion (BIC; Schwartz, 1978); Adjusted BIC (ABIC;

269 Sclove, 1987), entropy, and Lo, Mendell, and Rubin likelihood ratio test (LRT; Lo, Mendell, &

270 Rubin, 2001). The model that contains the smallest values on the AIC, BIC, and ABIC, as well

271 as the highest values on the log likelihood value and the entropy, indicates the best-fitting model

272 (Martinent & Nicolas, 2017). In addition, the LRT was used for model comparison (chi-square

273 difference test). Although there are no firm rules of thumb concerning the required sample size

274 in LPA, Collins and Wugalter (1992) and Park and Yu (2017) suggested a minimum N of almost

275 250. Moreover, because profiles with few participants (e.g. less than 5% of the total sample)

276 may be difficult to interpret or validate, it is generally advisable to select profiles comprising

277 more than 5% of the total sample (Collins & Lanza, 2010). Another main issue in LPTA relates

278 to the number of indicators (Martinent & Nicolas, 2017). In particular, adding indicators to a

279 LPA model could increase the number of possible response patterns, some of which may be

280 observed infrequently, leading to data sparseness (Collins & Lanza, 2010). Hence, researchers

281 generally prefer using fewer indicators (from 4 to 10 indicators) with LPA even if there are no

282 firm rules of thumb concerning this point (Collins & Lanza, 2010).

283   Thirdly, because the use of classify-analyze approaches (e.g., ANOVA) to compare

284 distal outcomes across anger profiles are related to several weaknesses (Nylund-Gibson,

285 Grimm, & Masyn, 2019), we used the Bolck, Croon, and Hagenaars (2004) method (BCH

286 method) to examine anger profile group differences on athlete burnout and coping. The

287 inclusion of some outcomes (athlete burnout and coping) in mixture models introduces some

288 complexity because the LPA measurement model (trait anger profiles) can substantially shift

289 when moving from the unconditional latent profile measurement model to a structural equation

290 mixture model including the anger profiles (Nylund-Gibson et al., 2019). The BCH method

291 allowed to compute athlete burnout and coping dimensions as consequences rather than

292 indicators of anger profiles. To perform the different analyses a confident interval of 95% was

293 taken and to work out the effect size Eta^2 was selected (Cohen, 1988). Finally, a series of chi-

294 square tests were conducted in order to identify demographic differences across the three anger

295 profiles such as gender, level of competition (international, national and under national), and

296 the type of practice (professional versus no professional players).

<div align="center">Results</div>

298 Anger latent profiles analysis

299   The LPA models were run by first testing a one-class model and then exploring models

300 with more classes. Table 1 includes fit information (log likelihood ratio, AIC, BIC, ABIC,

301 entropy, and LRT) for LPA models with one through five classes. For the AIC, BIC, and ABIC,

302 there were big drops between one and two classes and between two and three classes. The LRTs

303 also found that two classes showed better fit than one, three classes showed better fit than two,

304 four classes showed better fit than three, but five classes did not show better fit than four. Thus,

305 to achieve the balance between theoretical and statistical considerations, we used the model

306   parameters to make sense of the classes and decide which model fits best. As a result, based on

307   the interpretability of the anger profiles (i.e. the three-class solutions made more theoretical

308   sense and added substantive meaning to the understanding of anger profile than the two-class

309   solution whereas a fourth class did not add anything substantive to the understanding of anger

310   profiles) and the LPA statistical indicators, a three-class solution was selected.

311   The STAXI-II estimates were used to differentiate and add substantive meaning to the

312   anger profiles (Table 2). The anger profiles were labelled as: (a) High anger profile comprising

313   players with moderate scores of temperament, external expression, external control, reaction

314   and high scores, internal expression and control ($n = 91$); (b) Overwhelmed anger profile

315   comprising players with high scores on temperament, reaction, internal and external expression,

316   and low scores of internal and external control ($n = 13$); and (c) Low anger profile comprising

317   players with low levels of temperament, reaction, internal and external expression and high

318   levels of internal and external control ($n = 140$).

319   Anger profiles differences on athlete burnout symptoms and coping variables

320   Results of LPA using the BCH method are presented in Table 3 and provided evidence

321   of the statistically significant differences on athlete burnout and coping among the profiles. In

322   particular, results showed that: (a) players from the high anger profile reported significantly

323   higher scores of physical and emotional exhaustion ($Eta^2 = .06$), reduced sense of

324   accomplishment ($Eta^2 = .07$), resignation ($Eta^2 = .08$) and venting emotions ($Eta^2 = .12$) than

325   players belonging to the low anger profile; (b) players from the overwhelmed anger profile

326   reported significantly higher scores of reduced accomplishment ($Eta^2 = .07$), sport devaluation

327   ($Eta^2 = .04$), resignation ($Eta^2 = .08$), distancing ($Eta^2 = .03$) and venting emotions ($Eta^2 = .12$)

328   than players belonging to the low anger profile; and (c) players from the overwhelmed anger

329   profile reported significantly higher scores of sport devaluation ($Eta^2 = .04$) and distancing (Eta^2

330    $= .03$) than players belonging to the higher anger profile.

331 Anger Profiles Differences on Demographic Variables

332   Results of chi-square tests showed no significant difference ($p > .05$) across gender (χ^2

333 (2) = 8.35; Eta^2 = .15), and practice level (χ^2 (3) =1.43; Eta^2 = .09), but a significant difference

334 across athletes' status (χ^2 (2) = 8.67; $p < .05$; Eta^2 = .18). In particular, 62.5%, 8.33% and

335 29.16% of professional players belonged to high anger profile, overwhelmed anger profile, and

336 low anger profile, respectively whereas 34.54%, 5%, and 60.45% of non-professional players

337 belonged to the aforementioned anger profiles respectively.

338   Discussion

339   The aims of the study were to identify dispositional anger profiles in table-tennis players

340 and to examine whether participants from distinct profiles significantly differed on athlete

341 burnout and coping. The results of the present study advanced the knowledge base regarding

342 anger symptoms in sport settings in two ways. Firstly, latent profile analysis provided a

343 parsimonious yet nuanced summary of the heterogeneity of trait anger symptoms among table

344 tennis players involved in competitive sport situations. Rather than individually consider the

345 several trait anger dimensions, latent profile analysis emerged as an effective way to organize

346 information about anger dimensions in a meaningful way (Collins & Lanza, 2010; Martinent &

347 Nicolas, 2017). Indeed, these combinations of trait anger dimensions (anger profiles) informed

348 on the multivariate nature of trait anger symptoms, in contrast to previous literature in sport

349 which has mainly investigated the antecedents and/or consequences of anger dimensions in

350 isolation from other anger dimensions (Davis, 2011; Davis et al., 2010; Martinent & Ferrand,

351 2009; Martinent et al., 2012). Secondly, the latent profile approach has not only offered a robust

352 heuristic to examine the construct of trait anger within a more holistic approach but has also

353 allowed unpacking their complex associations with key sport outcomes such as coping and

354 athlete burnout. In contrast, previous studies primarily investigated the bivariate relationships

355   between anger dimensions and some other variables (Davis, 2011; Davis et al., 2010; Martinent

356   & Ferrand, 2009; Martinent et al., 2012).

357   The results revealed that three dispositional anger profiles emerged from latent profile

358   analysis among table tennis players: (a) a high anger profile with moderate scores of

359   temperament, external expression, and high scores of reaction, external control, internal

360   expression and control; (b) an overwhelmed anger profile with high scores on temperament,

361   reaction, internal and external expression, and low scores of internal and external control; (c) a

362   low anger profile with low levels of temperament, reaction, internal and external expression

363   and high levels of internal and external control. Most of the players pertained to the low anger

364   profiles (57% of the players) whereas the overwhelmed anger profile was the one with least

365   players (5% of the players). Whereas the proportion of men and women or international,

366   national and non-national players did not significantly differ across the three anger profiles, it

367   is noteworthy that the proportion of professional versus amateur players significantly differed

368   across the three anger profiles. In particular, the results showed that the high anger profile was

369   the most represented in terms of professional players whereas the low anger profile was over-

370   represented among amateur players. The significant difference identified in the present study

371   between professional versus amateur players contradicts the results of previous studies in other

372   sports which showed that amateur players reported significantly higher levels of anger

373   (González-García et al., 2019; Menéndez-Santurio & Fernández-Río, 2015). As this is the first

374   study, to our knowledge, to report that amateur players reported lower symptoms of anger in

375   comparison to professional players, future research should test this relationship again to see

376   whether it emerges in other samples, or whether it was a result specific to the current sample.

377   The results of the present study highlighted the usefulness of adopting a person-centred

378   approach (assessment of ideographic trait anger profiles) rather than a variable-centred

379   approach (Collins & Lanza, 2010; Martinent & Nicolas, 2017). Anger profiles (i.e. meaningful

380   combinations of trait anger dimensions and their respective magnitudes) revealed important

381   information regarding the functional nature of the anger construct. Whereas players from both

382   the high anger and low anger profiles experienced similar levels of reaction, players from the

383   high anger profile who also reported significantly higher scores of external anger expression

384   and internal anger expression were characterized by poorer psychological adjustment (higher

385   scores of reduced sense of accomplishment, physical and emotional exhaustion, resignation,

386   venting emotions). Thus, the present results suggested that trait anger dimensions likely operate

387   in conjunction with one another, and their effect might vary as a function of alternative anger

388   dimensions that are experienced concurrently. This is why instead of pitting the effect of one

389   anger dimension against another, future research should consider the profiles (the meaningful

390   configurations) of anger dimensions.

391   Of particular importance in the context of the present study, results revealed significant

392   differences across anger profiles on athlete burnout and coping scores. In particular, table tennis

393   players belonging to the low anger profile reported significantly lower scores of physical and

394   emotional exhaustion, reduced sense of accomplishment, sport devaluation, resignation,

395   distancing and venting emotions in comparison to the players belonging to the high anger

396   profile and/or the overwhelmed anger profile. These higher scores of athlete burnout symptoms,

397   disengagement and distraction-oriented coping reported by players from the high anger or

398   overwhelmed anger profiles suggested that these athletes were characterized by poorer

399   psychological adjustment (Doron & Martinent, 2016; Kurimay et al., 2017; Martinent & Decret,

400   2015). Furthermore, overwhelmed and high anger profile reported differences between them in

401   distancing and sport devaluation, in favour of overwhelmed anger profile, which signifies that

402   these profiles stands out by extreme scores in the cited variables. Thus, high anger and

403   overwhelmed anger profiles could be conceptualised as dysfunctional profiles that could be

404 classified as at risk of dropout and could, in turn, deserve the concern of sport practitioners and

405 sport psychologists.

406   The findings of the present study could also be used to enhance applied psychology

407 consultants' efforts with athletes in sport settings. The person-centred perspective used in this

408 study may be useful in identifying higher risk profiles for individuals in need of targeted and

409 adaptive intervention approaches. Indeed, knowing dispositional anger profiles of athletes

410 could help coaches and sport psychologists to tailor programs to groups of individuals with

411 particular trait anger characteristics. Furthermore, understanding relationships between

412 dispositional anger profiles and key sport outcomes (such as coping and athlete burnout) is

413 paramount for designing prevention and intervention strategies that will be most salient to

414 particular athletes. For instance, knowing which of the multivariate trait anger profiles are

415 associated with adaptive or maladaptive psychological adaptation (inferred from coping and

416 athlete burnout scores) could help practitioners in targeting athletes who could benefit the most

417 from changing their anger scores. Based on the results of the present study, players from the

418 high anger profile and from the overwhelmed anger profile should benefit the most from an

419 intervention on the anger construct. Moreover, the intervention designed on such players could

420 be adapted to the particular combinations of the trait anger dimensions of such players.

421   As is always the case with latent profile studies, the trait anger profiles are data-driven

422 and sample-specific (Collins & Lanza, 2010; Martinent & Nicolas, 2016). Future research is

423 needed to replicate the present findings with individuals of different ages, cultures and sports.

424 Another methodological limitation refers to the exclusive use of self-report questionnaires,

425 which are sensitive to some memory bias, as well as social desirability, exaggeration of results,

426 lack of motivation in the form-filling procedure, distraction and response in terms of the study

427 target (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Also, the use of a cross-sectional

428 design can be a limitation from the perspective that the time of the sample taking could not be

429   a representative moment (Podsakoff et al., 2003). In addition, despite the proven evidence that

430   LPA analysis can be run in little sample sizes (Collins & Wugalter, 1992; Park and Yu, 2017),

431   it might be considered as a possible limitation and this issue should be addressed in future

432   approaches. Notwithstanding these limitations, the present study proposed an alternative

433   person-centred approach that may provide researchers and practitioners with a useful way to

434   examine combinations of the several trait anger dimensions (Davis, 2011; Davis et al., 2010;

435   Martinent & Ferrand, 2009; Martinent et al., 2012). Because understanding relationships

436   between coping and athlete burnout with anger profiles is paramount for designing prevention

437   and intervention strategies that will be most salient to a particular athlete, knowing that players

438   from the high anger and overwhelmed anger profiles were characterized by poorer

439   psychological adjustment could help practitioners in targeting athletes who might benefit most

440   from changing their chronic anger experience. Hence, these results must be taken into

441   consideration to develop empirically proven interventions designed to help such athletes modify

442   their maladaptive anger profile in order to maximize their psychological adjustment to the

443   inherent demands of table-tennis.

444

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610

611   Tables

Table 1. Fit Indices for Latent Profile Analysis Models.

No. of classes	1	2	3	4	5
No. of free parameters					
log likelihood	-3956.20	-3824.84	**-3760.09**	-3733.91	-3705.69
AIC	7936.40	7687.69	**7572.18**	7533.83	7491.37
BIC	7978.37	7754.13	**7663.11**	7649.23	7631.26
ABIC	7940.33	7693.90	**7680.69**	7554.63	7504.46
LRT	—	262.72*	**129.50***	52.36*	56.46
Entropy	—	.80	**.90**	.84	.83
BLRT	—	262.72**	**129.50****	52.36**	56.46**

Note: AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; ABIC = Adjusted BIC; LRT = Lo, Mendell, and Rubin Likelihood Ratio Test;
* p < .05; ** p < .001; Bold entries reflect selected model.

612

613

Table 2. Estimates of Latent STAXI-2 Scores and Prevalence of Anger Profiles for the LPA Model.

Estimates of latent STAXI-2 scores and prevalence of anger profiles	Anger profiles		
	High anger profile (*N* = 91) (*SD*)	Overwhemed anger profile (*N* = 13) (*SD*)	Low anger profile (*N* = 140) (*SD*)
Temperament	10.05 (1.60)	16.76 (1.81)	6.08 (1.15)
Reaction	14.12 (3.16)	14.80 (3.74)	10.94 (3.12)
External Anger Expression	12.53 (2.59)	17.13 (2.07)	9.20 (2.21)
Internal Anger Expression	14.68 (3.21)	16.28 (2.36)	11.51 (3.13)
External Anger Control	16.47 (3.41)	12.86 (3.92)	19.88 (3.32)
Internal Anger Control	14.31 (3.79)	11.81 (4.64)	15.70 (4.45)

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Table 3. Profile Differences in Burnout and Coping using the Bolck, Croon, and Hagenaars Method.

	(a) High anger profile (n=91)	(b) Overwhelmed anger profile (n=13)	(c) Low anger profile (n=140)	Chi-Square tests				Eta^2	α
	M (SD)	M (SD)	M (SD)	overall test	(a) vs. (b)	(a) vs. (c)	(b) vs. (c)		
Physical and Emotional Exhaustion	12.13 (.45)	12.62 (1.34)	10.11 (.28)	15.61***	.12	13.45***	3.36¥	.06	.84
Reduce Sense of Accomplishment	13.05 (.39)	13.78 (1.26)	11.05 (.30)	18.09***	.30	15.49***	4.48*	.07	.63
Sport Devaluation	10.00 (.48)	13.27 (1.48)	9.34 (.33)	7.37*	4.40*	1.17	6.76**	.04	.78
Resignation	9.00 (.38)	9.16 (1.01)	7.00 (.23)	21.55***	.02	18.95***	4.33*	.08	.73
Relaxation	13.00 (.35)	13.70 (.72)	13.44 (.27)	1.22	.76	.91	.11	.01	.74
Distancing	7.06 (.25)	8.32 (.49)	6.55 (.19)	12.19**	5.32*	2.38	11.58***	.03	.43
Logical Analysis	24.77 (.49)	24.77 (.96)	24.52 (.36)	.19	.00	.16	.06	.00	.61
Seeking for support	6.82 (.25)	6.92 (.72)	6.93 (.20)	.11	.02	.11	.00	.00	.83
Imaginery/Thought Control	18.18 (.37)	19.17 (.61)	18.88 (.29)	2.69	1.85	1.99	.18	.01	.64
Venting Emotions	8.81 (.35)	9.00 (.80)	6.56 (.23)	31.35***	.05	26.73***	8.56**	.12	.78
Mental Distraction	6.41 (.29)	8.10 (.96)	6.50 (.24)	2.80	2.77	.05	2.59	.02	.73

Note. ¥ *p* ≤ .07 * *p* < .05 ** *p* < .01 *** *p* < .001.

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