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### Article

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# 1 Investigating Stress and Coping During Practice and Competition in Tennis 2 using Think Aloud

## 4 **Abstract:**

5 Aim: The purpose of this study was to examine stress and coping in both  
6 competition and practice in tennis and to further investigate gender difference  
7 using Think Aloud protocol (TA) in real-time.

8 Method: 16 (8 males and 8 females) competitive tennis players took part. A within  
9 groups design was implemented, and participants verbalised their thoughts  
10 between points of a championship tie-break during a practice and a competition  
11 condition. Data was transcribed verbatim, analysed for stressors (confidence,  
12 performance, external, physical) and coping responses (problem, emotion,  
13 avoidance) using deductive analysis. A CSAI-2R questionnaire was used to  
14 assess anxiety levels prior to practice and competition.

15 Results: CSAI-2R results showed cognitive anxiety significantly increased from  
16 practice to competition. Performance-focused coping (e.g., planning, technical)  
17 was verbalised most frequently in both conditions. Performance stressors (e.g.,  
18 outcome, tactics) were verbalised most frequently in both conditions. Males  
19 verbalised significantly more performance stress in competition and physical  
20 stress in practice. Females verbalised external stress and utilize problem-focused  
21 responses more in competition than practice. Problem-focused coping was  
22 utilised most for males and females in both conditions.

23 Conclusion: Through the use of a novel data collection method (TA) this study  
24 provides context-specific findings within tennis, which support previous research  
25 in stress and coping where gender differences occur only for the type of stressor  
26 appraised. TA has also been found to be a viable method to assess stress and  
27 coping data in tennis. Findings can inform coaches, players, and psychologists  
28 about stressors and coping responses utilised during practice and competition.

29 **Keywords:** tennis, stress, coping, Think Aloud, gender.

## 32 **Introduction**

33 Research into stress and coping has been conducted in various sports, such as figure skating  
34 (Gould, Finch & Jackson, 1993), cricket, (Thelwell, Weston & Greenlees, 2007) golf  
35 (Giacobbi, Foore & Weinberg, 2004) and tennis (Puate-Diaz & Anshel, 2005) and have found  
36 a variety of stressors appraised by athletes in high pressure situations. The athlete's ability to  
37 cope with these stressors can have a significant effect on their performance (Lazarus, 2000),  
38 highlighting the importance of understanding stress and coping responses within sport. Stress  
39 has been defined as the "quality of experience, produced through a person-environment  
40 transaction, which through either over arousal or under arousal, results in psychological or  
41 physiological distress" (Aldwin, 2007, p. 24). The Transactional Model of Stress and Coping  
42 (TMSC) (Lazarus & Folkman, 1984) is widely used within sport (Britton, Kavanagh &  
43 Polman, 2017; Burgess, Knight & Mellalieu, 2016; Nicholls & Polman, 2007). Nicholls and  
44 Polman (2007) carried out a systematic review on the stress and coping literature within sport  
45 and found the TMSC to be supported by 46 of 64 studies. Crucially, a significant interaction  
46 between stressors and coping responses was found, with the stressor experienced influencing  
47 the type of coping response the athlete utilised (Anshel, 1996; Anshel, Jamieson & Raviv,  
48 2001).

49 The TMSC shows that coping in response to stressful events occurs in a series of stages.  
50 The first stage is the primary appraisal of the event. Lazarus proposed that we are constantly  
51 evaluating the environment around us during the process of cognitive appraisal. Our own  
52 experiences within the social and cultural environment will impact what an individual  
53 perceives as harm, threat and challenge. Harm refers to damage that has already occurred, threat  
54 refers to expectation of future harm and challenge refers to viewing stress in a positive way.  
55 These are the three types of primary appraisals that can cause the stress response to be elicited  
56 (Lazarus & Folkman, 1984). Once this has occurred, an individual will judge whether there are  
57 any actions that can be taken to reduce the source of appraisal and strive to change undesirable  
58 or distressing emotions (Lazarus, 1999). This is called the secondary appraisal, where coping  
59 responses occur to reduce the threat, harm or challenge that has been perceived in the  
60 environment. Secondary appraisal has an impact upon coping exhibited by the individual, and  
61 whether they believe there is anything they can do to reduce the stressor in the environment.  
62 Those who maintain good coping responses are less likely to appraise a situation as threatening  
63 primarily (Lazarus & Folkman, 1984).

64 Coping can be defined as “constantly changing cognitive and behavioural efforts to  
65 manage specific external and/or internal demands that are appraised as taxing or exceeding the  
66 resources of the person” (Lazarus & Folkman, 1984, p.141) and is crucial if athletes want to  
67 perform successfully in their sport (Haney & Long, 1995). Within sports, poor coping has been  
68 found to increase muscle tension and reduced focus (Anshel, Brown & Brown, 1993)  
69 demonstrating that effective coping mechanisms are integral to successful performance (Haney  
70 & Long, 1995). Furthermore, athletes in individual sports have been found to use more coping  
71 responses than athletes from team sports (Anshel, 2001; Holt & Hogg, 2002), showing it is  
72 important that specific sports are investigated.

73 Coping responses can be categorised into broader themes. The most widely used coping  
74 dimensions are problem-focused, emotion-focused and avoidance coping (Compas, Connor-  
75 Smith, Saltzman, Thomsen & Wadsworth, 2001; Nicholls & Polman, 2007). Problem-focused  
76 coping responses help to alter the stressful situation by eliminating the stressor (Lazarus &  
77 Folkman, 1984), whereas emotion-focused coping involves strategies to help the individual  
78 regulate emotional arousal and distress. Finally, avoidance coping consists of behavioural and  
79 cognitive efforts to disengage oneself from a stressful event (Kaiseler, Polman & Nicholls,  
80 2012).

81 When moving from practice to competition, the pressure in the environment increases  
82 and the athlete can experience more debilitating anxiety leading to a performance decrement  
83 (Baumeister, 1984, Hill, Hanton, Matthews & Flemming, 2010). Few studies have researched  
84 differences in stress and coping between practice and competition (Nicholls et al., 2009),  
85 however, some have measured coping independently from stress (Crocker & Isaak, 1997).  
86 These findings demonstrate greater stability of coping responses in practice than competition  
87 in swimmers, and different coping patterns across competition and training sessions. In another  
88 study, Kerdijk et al. (2016) used interviews and self-report measures to investigate the  
89 influence of the social environment on stress and coping in hockey. Findings revealed that the  
90 context (competition or practice) was a factor in the choice of coping response, with problem-  
91 focused coping being the most frequently utilised coping responses in competition and  
92 avoidance focused coping, or no coping at all, was used most frequently in practice (Kerdijk et  
93 al., 2016).

94 Further considerations within the stress and coping literature have taken into account  
95 gender gender differences. Research suggests that stress and coping may differ between

96 genders, with male and female athletes using different coping responses during stressful  
97 situations (Kaiseler, et al., 2012; Nicholls & Polman, 2007). Kaiseler et al., (2012) investigated  
98 gender differences in stress, appraisal and coping in golf putting using TA. They found no  
99 differences in stressor intensities but found females reported task execution stressors (based on  
100 how the whole skill was executed) more frequently, in comparison to males, who experienced  
101 more outcome stressors (stressors based on the result of the point). Despite being in similar  
102 contexts, different stimuli in the environment were appraised as stressful between genders and  
103 the frequency of appraisals differed. For example, females reported more technique coping and  
104 self-talk to cope with task execution and outcome stressors whereas males utilised more  
105 external attribution for the outcome stressor. This suggests women are more likely to be task-  
106 orientated, whereas males are more likely to be ego-orientated (Kaiseler et al., 2012) due to  
107 differences in motivational orientation. Despite these findings, gender differences within sports  
108 are still not clearly defined, with some research reporting differences in coping, such as females  
109 using more coping responses at higher intensities (Tamres, Janicki & Helgeson, 2002) but  
110 without consistent patterns of results. Furthermore, some studies have found no evidence for  
111 gender differences (Kowalski, Crocker, Hoar & Niefer, 2005). Inconsistencies in these findings  
112 may be due to the larger context of stressors not being considered in respects to coping  
113 responses or due to the nature of the sport studied.

114 Two hypotheses have been widely used to explain why males and females may differ  
115 in their coping responses. The situational hypothesis predicts differences between genders  
116 disappear when in similar conditions, although differences are apparent across situations and  
117 social roles (Rosario, Shinn, Morch & Huckabee, 1988). The dispositional hypothesis predicts  
118 that gender differences in coping occur due to differing characteristics of males and females  
119 (Tamres et al., 2002). Kaiseler et al. (2012) found genders differ based on their different  
120 appraisals of the stressful event, with differences only found for the stressor types and not  
121 coping responses. This shows tentative support for the situational hypothesis, and supports  
122 previous research, that coping differs only in the stressor type when comparing genders (Lee-  
123 Bagley, Preece & DeLongis, 2005).

124 The only current research in stress and coping within tennis is by Puente-Diaz and  
125 Anshel (2005), this research identified sources of stress, appraisal and coping within tennis.  
126 Despite finding differences in stress and coping between cultures, only general stress and  
127 coping within tennis was investigated using a retrospective design. The retrospective nature of  
128 many studies within the stress and coping literature has been criticised due to a significant time

129 delay between experiencing stress and recalling how they coped (Nichols & Polman, 2007;  
130 Ntoumanis & Biddle, 1998), reducing the reliability of recalled data. However, Whitehead,  
131 Taylor, and Polman (2016) reported that Think Aloud protocol analysis (TA) can be used to  
132 better understand in-event cognitive processing in sport performance. Therefore, highlighting  
133 the potential for research to investigate real-time stressors and coping responses in tennis and  
134 reducing external bias that alters participants' recall of experience.

135 Few studies have directly focused on thought processes in tennis, with current literature  
136 only covering expertise, culture, differences in planning strategies and tactical skills in novice  
137 and elite players (del Villar, González, Iglesias, Monreno & Cervelló., 2007; McPherson, 2000;  
138 McPherson & Kernodle, 2007; Puente-Diaz & Anshel, 2005). McPherson and Kernodle (2007)  
139 employed recall interviews where participants would recall what they were thinking about  
140 between points and were asked 'what were you thinking about while playing that point?' These  
141 responses were verbalised into a cassette recorder which was situated at the back of the court.  
142 Findings revealed that varsity players exhibited fewer tactical concepts than professionals.  
143 Investigations into stressors and coping responses between practice and competitive play in  
144 tennis will expand the research area, as sources and types of stress in sport have been found to  
145 vary based on sport type (Anshel & Wells, 2000; Anshel, Williams & Williams, 2000; Goyen  
146 & Anshel, 1998). These findings may then shed light on how performance decrements can be  
147 reduced when moving into high-pressure conditions.

148 To reduce the memory decay issues surrounding retrospective methods, TA has been  
149 previously employed in sport research to investigate cognitive thought processes, in sports such  
150 as golf, distance running, cycling and snooker (Samson, Simpson, Kamphoff & Langlier, 2017,  
151 Whitehead, Taylor & Polman., 2016; Welsh et al., 2018; Whitehead et al., 2017; Whitehead et  
152 al., 2018). During TA, participants verbalise their thoughts throughout the task (Ericsson &  
153 Simon, 1980), allowing for a real-time capture of their thought processes to better understand  
154 cognition in sporting events (Whitehead et al., 2016). With the dominant research design within  
155 stress and coping in sport being retrospective, TA provides a methodology to gather real-time  
156 reports. Ericsson and Simon (1993) distinguished three levels of TA each identifying different  
157 amounts of additional processing required to produce vocalisation. Level 1 TA requires the  
158 individual to make no effort to communicate their thoughts as it is vocalisation of inner speech.  
159 Level 2 TA involves the explanation of information that is presently not in a person's focus of  
160 attention but must be recoded into verbal form before it can be reported. The explication or  
161 recoding involves additional processing but does not bring new information into the person's

162 focus of attention (Hertzum, Handzen & Anderson, 2009). Finally, Level 3 TA requires the  
163 individual to explain their thoughts, ideas, hypotheses, or motives. Level 3 has been criticised  
164 for potentially impacting performance, although this has recently been challenged. For  
165 example, Whitehead, Taylor and Polman (2015) found level 3 verbalisations do not lead to a  
166 performance decrement in golf putting.

167         The current study aims to develop previous literature by analysing the relationship  
168 between tennis players' stressors and coping responses during practice and competition, which  
169 to the authors knowledge has not been undertaken in previous literature, using a real time  
170 method such as TA. It is hypothesised that problem-focused coping will be the most frequently  
171 utilised in competition and avoidance coping in practice (Kerdijk et al., 2016). The secondary  
172 aim was to conduct a gender comparison on sources of stress and coping responses. It is  
173 hypothesised that, differences only found for the stressor types, not coping responses (Kaiseler  
174 et al., 2012; Lee-Baggley et al., 2005), supporting the situational hypothesis. Additionally, it is  
175 hypothesised that females will verbalise stressors relating to task execution, whereas males will  
176 verbalise more stressors concerned with the outcome, showing males to be more ego-orientated  
177 and females to be more task-orientated (Kaiseler et al., 2012).

178

## 179 **Methods**

### 180 *Participants*

181 16 participants took part in the study and were all part of a division 1 tennis league in the North  
182 West of England. All participants played competitively on average of once per week. Of the  
183 16 participants (age:  $M = 28.63$ ,  $SD = 12.11$ ) 8 were males (age:  $M = 20.75$ ,  $SD = 0.66$ ) and 8  
184 were females (age:  $M = 36.50$ ,  $SD = 12.99$ ). The study and protocol were approved by the  
185 authors institutional ethics committee and participants provided informed consent prior to data  
186 collection.

### 187 *Materials*

188 The study took place on a hard tennis court surface at the participant's home courts. Participants  
189 used their own racquets and new balls provided by the researcher. Olympus DM-650 digital  
190 recorders were used to gather real-time verbal data from participants between points. These  
191 were placed in the participant's pocket, with a small clip-on microphone attached to the shirt  
192 collar to ensure clarity of sound.

193 Prior to each condition, each participant completed the Competitive State Anxiety  
194 Inventory-2 Revised (CSAI-2R; Cox, Martens, & Russell, 2023) to check the competition  
195 manipulation. The CSAI-2R was used as the original CSAI-2 (Martens, Vealey, & Burton,  
196 1990) has been criticised due to the original validation being based on small sample sizes and  
197 having poor structural validity (Cox et al., 2003). The CSAI-2R is a multi-dimensional domain-  
198 specific instrument to assess participants affect and cognitions about sporting situations (Lagos,  
199 Vaschillo et al., 2008). The 17 items within the CSAI-2R represent three subscales, including  
200 somatic anxiety, cognitive anxiety and self-confidence. Previous research has demonstrated  
201 high internal consistency for the CSAI-2R subscales (Lagos, Vaschillo et al., 2008).  
202 Participants are required to answer on a 4-point Likert scale ranging from “not at all” to “very  
203 much so.” The cognitive anxiety and self confidence subscales are made up of 5 items and the  
204 somatic anxiety subscale is made up of 7 items. As instructed by Cox et al, (2003) each subscale  
205 score is to be obtained by summing, dividing by the number of items, and multiplying by 10,  
206 leading to the intensity score ranging from 10 to 40.

207 Prizes were required for the competitive condition to reflect a true competition. By  
208 winning their first match in the competitive condition they would win a tube of tennis balls,  
209 and the winner of the overall competition won a £20 Amazon voucher.

210

## 211 ***Procedure***

212 Prior to the first condition, all participants were briefed on TA protocol (Ericsson & Kirk,  
213 2001). Approximately one hour prior to the first condition, participants met with the first author  
214 and were taken through a series of non-sport specific TA practice tasks (Eccles, 2012; Ericsson  
215 & Kirk, 2001) in order to become accustomed to thinking aloud and were instructed to verbalise  
216 what they were thinking (TA Level 2). Tasks included: a) counting the number of dots on a  
217 page, b) a problem-solving task, and c) an arithmetic exercise. Participants then used TA during  
218 their tennis specific warm up and were able to gain clarification on the process and ask any  
219 questions prior to starting the actual task. The whole TA training process took between 20-30  
220 minutes per participant and participants then began condition 1 within 30 minutes of TA  
221 training. The researcher was positioned out of direct view of the participants during the tasks.  
222 Participants were instructed to verbalise between points to reduce any interference with motor  
223 movement during skill execution (Schmidt & Wrisberg, 2004) and had “Think Aloud” written  
224 on their non-dominant hand to remind them to verbalise between points. Specific instructions

225 of “please think aloud between points, only say what you are thinking at the time, do not try to  
226 explain your thoughts” were given to each participant. Participants then competed in two  
227 conditions in a within groups design. Conditions were randomly counterbalanced (Whitehead  
228 et al., 2016). Participants were randomly allocated a same-sex partner whom they played  
229 against in both conditions to make sure the level of play was not having an effect on conditions.  
230 Prior to each condition participants completed the CSAI-2R (Cox, et al., 2003). In the practice  
231 condition, participants played points against their allocated opponent in singles, tiebreak  
232 formation without scoring. They were told that this was just “practice” and that they would not  
233 be required to report the score back to the researcher or any other person. Participants were  
234 asked to play for the average championship tie-break time of 20 minutes. This condition was  
235 designed to be non-threatening and non-competitive. All participants are members of the same  
236 team and they were comfortable and familiar with playing against one another. Additionally,  
237 participants were familiar with the courts and environment as it is their home training facility.  
238 In the competition condition, participants played against their allocated opponent in singles  
239 formation whilst scoring using championship tie-break rules. Within the competition condition  
240 the championship tie-breaks took between 12-16 minutes to complete and participants had the  
241 standard 20 seconds between points to verbalise their thoughts at the back of the court and be  
242 ready for the next point. Participants changed ends every 6 points with no reset period. In this  
243 condition, a competitive setting was created by notifying participants that a prize of a tube of  
244 tennis balls would be given to the winner of the championship tie-break. Participants were  
245 informed that the two players who won their competitive tie break with the biggest point’s  
246 difference, would go into a final to receive a £20 Amazon voucher. However, the final was not  
247 recorded. The pressure manipulation phase of this study was similar to previous studies (Vine  
248 & Wilson 2010; Vine, Moore & Wilson 2011), in which they created cognitive anxiety through  
249 conducting a competition, where participants were informed the individuals with the best  
250 performance would receive a monetary prize. In addition, presentations for the winners  
251 occurred (Whitehead et al., 2016) and results were posted to the team’s social media website  
252 to create a competitive environment.

253

### 254 *Analysis*

255 Following data collection, all audio files were transcribed verbatim with checks for relevance  
256 and consistency being made. Each transcript was subject to a line by line content analysis

257 (Maykut, Maykut & Morehouse, 1994) to identify stressors and coping responses during each  
258 condition using NVivo (2015) qualitative analysis software. Units of information were coded  
259 and put into categories in order for comparisons to be made between each condition. In a similar  
260 process to Kaiseler et al. (2012), verbalisations that were perceived as causing the participants'  
261 negative concern of worry or had the potential to do so were coded as stressors. Further,  
262 verbalisations where participants attempted to manage a stressor were coded as coping  
263 responses. Transcriptions were then coded and grouped into themes and general dimensions.  
264 In keeping with the majority of research in TA (e.g., Arsal, Eccles & Ericsson, 2016; Nicholls  
265 & Polman, 2008; Whitehead et al., 2017) a post-positivist epistemology informed this study.  
266 Consistent with this, inter-rater reliability was calculated to ensure rigour. The third author then  
267 acted as a 'critical friend' and discussions regarding coding data into themes occurred. The  
268 content analysis of verbalisations was both inductive and deductive. The first author identified  
269 verbalisations based on a coding scheme adapted from Kaiseler et al. (2012) for stressors (Table  
270 1) and coping responses (Table 2). Stressors were split into four secondary themes (confidence,  
271 performance, external and physical) and coping responses where themes were split into three  
272 secondary themes (problem-focused, emotion-focused and avoidance coping), which have  
273 been widely used within coping literature (Kaiseler et al., 2012; Kerdijk et al. 2016; Nicholls  
274 & Polman, 2007). Coding themes used for stress and primary coping differed somewhat due to  
275 Kaiseler investigating a different type of sport (Nicholls, Polman, Levy, Taylor & Cobley  
276 2007), and using aspects of self-report within the study.

277

278         Several statistical analyses were used for the current study. Given the research design  
279 and a small number of participants, a series of nonparametric Wilcoxon matched-pairs signed  
280 ranks tests were conducted to examine the differences in stress and coping responses between  
281 competition and practice conditions. Mann-Whitney U tests were used to investigate the gender  
282 differences in stress and coping responses per condition. To identify a possible interactional  
283 relationship between the condition and gender on stress and coping responses, a series of  
284 bivariate correlation analyses and multivariate analysis of variance (MANOVA) with bootstrap  
285 methods were conducted due to the nonparametric nature of the data (Konietschke, Bathke,  
286 Harrer, & Pauly., 2015). While an alpha level of .05 is recommended, a .10 alpha level of .10  
287 were also considered, consistent with previous studies using small experiments (Weisburd,  
288 2000). Additionally, Pearson's correlations were run in order to analyse the relationship  
289 between stress and coping responses in each condition and also between gender. The magnitude

290 of correlations was 0-0.3 being low, 0.31-0.5 being moderate and greater than 0.5 being high  
291 (Dancey & Reidy, 2004).

292 Insert Table 1 and Table 2 here.

## 293 **Results**

### 294 *Competition Manipulation*

295 A paired samples t-test with bootstrap method was carried out on the CSAI-2R questionnaire  
296 data. Analysis of the subscales revealed that there was a significant difference in cognitive  
297 anxiety, ( $t(15) = -2.43, p = .03$ ) where participants demonstrated higher cognitive anxiety  
298 scores in competition ( $M = 21.37, SD = 7.78$ ) in comparison to practice ( $M = 18.00, SD =$   
299  $6.61$ ). A further analysis of gender, revealed a significant difference for females in cognitive  
300 anxiety between practice ( $M = 17.50, SD = 5.11$ ) in competition ( $M = 23.25, SD = 5.70$ ), ( $t$   
301  $(7) = -2.48, p = .04$ ). However, no significant difference was apparent for cognitive anxiety in  
302 the male participants ( $t(7), = -.88, p = .41$ ).

303 A difference was found between the means for somatic anxiety in practice ( $M = 13.02.$   
304  $SD = 5.61$ ) and competition ( $M = 15.57, SD = 5.77$ ), however this difference was not significant  
305 ( $t(15) = -1.67; p = .12$ ). When analysing genders separately, no significant differences were  
306 found for males ( $t(7) = -.15; p = .88$ ) or females ( $t(7) = -2.11, p = .08$ )

307 No significant difference was found in the self-confidence subscale during practice ( $M$   
308  $= 27.37, SD = 3.77$ ) and competition ( $M = 26.87, SD = 4.95$ ), ( $t(15) = 0.30, p = .76$ ). When  
309 analysing genders separately, no significant differences were found for males ( $t(7) = -.83, p$   
310  $= .42$ ) or females ( $t(7) = 1.14, p = .29$ ).

311

### 312 *Total Verbalisations*

313 Mean (SD) values for verbalisations of primary and secondary stressor themes are presented  
314 in Table 3. Table 4 provides the overall percentages of primary and secondary stressors  
315 verbalised during competition and during practice. This shows performance stressors to be  
316 the most frequently verbalised in both practice (80.0%; 100 out of 125 verbalisations) and  
317 competition situations (79.0%; 107 out of 134 verbalisations), with only marginal differences  
318 found between conditions. Overall, participants experienced performance-related stress,  
319 followed by external, physical, and confidence stressors. Wilcoxon signed-rank tests found

320 within-group differences in three of the secondary themes in stress responses, namely, goal  
321 endangerment,  $Z = 1.732$ ,  $p = .083$ , lack of concentration,  $Z = 1.890$ ,  $p = .059$ . When tested  
322 separately, male participants verbalised performance stressors more frequently (89.2% vs  
323 71.0%) in the competition condition as opposed to the practice situation. Conversely, female  
324 participants experienced a greater level of external stress in the competition condition than  
325 the practice condition (18.8% vs 3.0%).

326 Insert table 3 and 4 here.

327 Mean (SD) values for verbalisations of primary and secondary coping responses are  
328 presented in Table 5. Table 6 provides the overall percentages of primary and secondary  
329 coping dimensions verbalised during competition and during practice. This shows problem-  
330 focussed coping to be the most frequently verbalised coping strategy in both practice (54.3%)  
331 and competition (59.3%), followed by emotion (40.1 & 37.7%) and avoidance coping  
332 responses (5.7% & 3.0%). Results from Wilcoxon tests indicated that there were within-  
333 group differences in increasing effort,  $Z = 2.374$ ,  $p = .018$ , and venting emotion,  $Z = 1.992$ ,  $p$   
334  $= .046$ . In comparison to the practice condition, both males and females increased efforts  
335 while females vented more emotion in the competition condition.

336 Insert table 5 and 6 here

### 337 ***Stress & Coping Responses***

338 To examine the relationship between stress types and coping responses, Pearson's correlation  
339 analyses were carried out. Within the competition condition, correlations were conducted and  
340 indicated that there were significant associations between external stressor and avoidance  
341 coping ( $r = .52$ ,  $p = .039$ ), and physical stressor and avoidance coping ( $r = .77$ ,  $p = .001$ ),  
342 indicating that those who experience external and physical stressors are likely to employ  
343 avoidance coping strategies.

344 Person's correlation analyses in practice indicated avoidance coping was associated  
345 with the confidence stressor ( $r = .50$ ,  $p = .050$ ), implying that subjects who confront  
346 confidence stressors are likely to utilize avoidance strategies. In addition, there was a  
347 possibly meaningful association between emotion-focussed coping and the physical stressor  
348 ( $r = -.47$ ,  $p = .065$ ), indicating that those who more frequently utilize emotion-focussed  
349 coping would experience less frequent physical-related stress.

350

351 ***Gender Comparison***

352 *Total Verbalisations*

353 Mean (SD) values of primary and secondary stressor themes for males and females can be  
354 seen in Table 3. Table 4 provides the overall percentages of primary and secondary stressors  
355 verbalised by males and females during each condition. In practice and competition,  
356 performance is shown to be the main stressor for both males and females. However, results  
357 indicate that males experience less performance stress in practice (70.7%) than in competition  
358 (89.2%) whereas females experience more in practice (88.1%) than competition (71.0%). Of  
359 the primary themes, performance is the most frequently verbalised for males in competition  
360 (61.5%) compared to practice (39.7%), and for females in practice (65.7%) compared to  
361 competition (43.5%).

362 Mean (SD) values of primary and secondary coping responses for males and females  
363 can be seen in Table 5. Table 6 provides the overall percentages of primary and secondary  
364 coping responses verbalised by males and females during each condition. In practice and  
365 competition, problem-focussed coping is shown to be the main coping response used for both  
366 males and females. However, females experience more problem-focussed coping in practice  
367 (59.8%) compared to competition (48.7%) whereas male problem focussed coping remained  
368 consistent across conditions (49.6% vs. 48.7%). In terms of primary themes, planning was the  
369 most frequently utilised for males in practice (32.2%) compared to competition (30.8%) and  
370 for females in practice (38.1%) compared to competition condition (37.8%).

371 *Stress and Coping Gender Comparison*

372 Mann-Whitney U-tests were conducted to investigate between subjects (i.e., gender  
373 differences) in stress and coping responses. In the practice condition, the two gender groups  
374 differed significantly from each other on performance stress,  $U = 10.00$ ,  $p = .018$ , and  
375 external stress,  $U = 18.00$ ,  $p = .099$ . Female participants experienced performance stressors  
376 more often than their male counterparts while male subjects experienced external stressors  
377 more frequently in the practice condition. Among the secondary themes of stress responses,  
378 the between group differences were also found with performance ( $U = 7.50$ ,  $p = .009$ ),  
379 opponent ( $U = 20.00$ ,  $p = .064$ ), and physical discomfort ( $U = 19.00$ ,  $p = .095$ ). Female  
380 participants verbalised a greater level of performance stress in comparison to their male  
381 counterparts while male participants verbalised a greater level of stressors in related to  
382 opponent and physical discomfort.

383           However, no group difference was found in both the primary and secondary themes of  
384 coping responses. In the competition condition, a group difference was found with physical  
385 stress,  $U = 20.00, p = .064$ . Additional gender differences were found with positive self-talk  
386 coping responses ( $U = 14.00, p = .053$ ), and opponent-related stress ( $U = 20.00, p = .064$ ). In  
387 all three cases, male participants exhibited a greater level of stress and coping responses in  
388 comparison to their female counterparts. Overall, results indicated that males perceived a  
389 greater level of performance stress in the competition situation while greater physical stress  
390 in the practice situation.

391           MANOVA with bootstrap method showed no main effect based on respondent's  
392 gender and play condition. However, similar to the results of Mann-Whitney tests, a 'Gender  
393 by Condition' interaction was found,  $F(4, 25) = 3.45, p = .022$ , Wilks' Lambda = 0.64, eta-  
394 square = .36. MANOVA results indicated a 'gender by condition' interaction effect on:  
395 Performance stress,  $F(1, 31) = 5.36, p = .028, \eta^2 = 0.16$ ; physical stress,  $F(1, 31) = 4.80, p =$   
396  $.037, \eta^2 = .15$ ; and external stress,  $F(1, 31) = 4.38, p = .046, \eta^2 = .14$ . Performance stress was  
397 reported more often by females in practice and males in competition. On the contrary,  
398 external and physical stress was more frequently reported by males in practice and females in  
399 competition. This was not found to be significant for the confidence stressor  $F(1,31) = 1.34, p$   
400  $= .257, \eta^2 = .05$ . No significant results were found when running MANOVA on coping  
401 responses.

402           To examine the relationship between stress types and coping responses, Pearson's  
403 correlation analyses were carried out on male and female data separately. Male stress and  
404 coping in both conditions combined shows significant associations between the physical  
405 stressor and avoidance coping ( $r = .789, p < .001$ ). Female stress and coping in both  
406 conditions combined shows significant associations between physical stressor and emotion  
407 focused-coping ( $r = -.520, p = .039$ ). In addition, there was a possibly meaningful association  
408 between emotion-focused coping and confidence stressor ( $r = .467, p = .068$ ),

## 409 **Discussion**

### 410 ***Stress and coping in practice and competition***

411           The primary aim of this study was to examine sources of stress and coping responses in practice  
412 and competition in tennis using TA. Results support the first hypothesis, that problem-focused  
413 coping is the most frequently utilised in competition. This is followed by emotion-focused and  
414 avoidance coping, which is consistent with previous research on coping responses in sport

415 (Kerdijk et al., 2016). However, problem focused coping was verbalised most frequently in  
416 practice therefore rejecting the hypothesis that avoidance coping would be verbalised most  
417 frequently in practice. The most frequently verbalised stressor in practice and competition was  
418 the performance stressor, followed by the external, confidence and physical stressor  
419 respectively. No significant differences were found in the frequency of the technical stressor  
420 between practice and competition. Performance stress, the secondary theme for technical stress,  
421 was found to be the most frequently occurring stressor, however an increase was not seen from  
422 practice to competition.

423 Additional findings show significant associations between external stressors and  
424 avoidance coping, as well as between the physical stressor and avoidance coping in the practice  
425 condition but not competition. This may indicate that players are trying to block out or forget  
426 about external distractions and physical discomfort during practice and has been found to be  
427 used by elite athletes when facing a stressor (Yoo, 2001). Within the competition condition,  
428 avoidance coping was associated with the confidence stressor. This suggests that participants  
429 who utilise avoidance coping more frequently experience fewer confidence stressors and this  
430 could be an effective coping response for athletes experiencing low confidence stressors. This  
431 finding contradicts previous suggestions in research, such as Roth and Cohen (1986) who  
432 argued that avoidance coping is more likely used when emotional resources are limited (e.g., a  
433 person has low self-esteem), therefore, this finding may have just been a short-term effect.  
434 However, further research is required as previous literature found no significant relationship  
435 between avoidance coping and confidence when experiencing performance slumps (Grove &  
436 Heard, 1997; Levy, Nicholls & Polman; 2011). Furthermore, athletes experiencing greater  
437 avoidance coping have been found to report greater cognitive anxiety (Hammereister & Burton,  
438 2001) and therefore this may not be the most successful coping response to utilise.

### 439 *Gender differences in stress and coping*

440 The secondary aim was to conduct a gender comparison on sources of stress and coping  
441 responses. Results indicate that male tennis players perceived a higher level of external and  
442 physical related stress in the practice condition, whereas female players perceived higher levels  
443 of external and physical stress in the competition condition. In terms of performance stress,  
444 males experienced greater levels in competition, whereas females experienced greater levels in  
445 practice. Therefore, we can accept the hypothesis that gender differences occur only for the  
446 type of stress appraised, not the coping response. This supports previous gender comparisons

447 within the stress and coping literature in sport (Kaiseler, et al., 2012; Lee-Bagglely et al., 2005)  
448 as well as the situational hypothesis. This suggests differences in coping responses between  
449 genders is due to males appraising the same situation differently to females (Rosario et al.,  
450 1988). The hypothesis that females will verbalise stressors of task execution more frequently,  
451 whereas males will verbalise more stressors concerned with the outcome, showing males to be  
452 more ego-orientated and females to be more task-orientated (Kaiseler et al., 2012) was not  
453 supported. Females did verbalise a higher percentage of outcome stressors and males verbalised  
454 a higher percentage of stressors based on task execution, however this was not significant.

455         Significant associations were found between the physical stressor and emotion-focused  
456 coping in females, supporting the common notion that females exhibit more emotion-focused  
457 coping responses (LaFrance & Banaji, 1992; Nicholls & Polman, 2007; Yoo, 2001). For males,  
458 there was a significant association between the physical stressor and avoidance coping. This  
459 supports previous findings that suggest males are more likely to deny a problem exists through  
460 avoidance-coping (Tamres et al., 2002). This suggests that when experiencing physical stress,  
461 males and females have a different preferred coping response. Females may experience greater  
462 emotion-focused coping due to common assumption that they may express emotion more  
463 frequently than men (Brody & Hall, 1993; De Fruyt, 1997), suggesting that gender socialisation  
464 theory may be in action. This theory predicts that men are more likely to cope with stressors  
465 by denying or avoiding the stressor as they are socialised to not express their emotions (Tamres  
466 et al., 2002). However, these differences in coping may be due to different appraisals of the  
467 stressor as found in previous sport psychology literature (Kaiseler et al., 2012), supporting the  
468 situational hypothesis.

#### 469 ***Potential limitations and implications for future research***

470 Overall, the manipulation check showed an increase in cognitive anxiety from practice to  
471 competition, but no significant differences in somatic anxiety and self-confidence. As  
472 cognitions were the primary measurement in the current study, this difference should be  
473 sufficient to identify a change in thought verbalisations between conditions. A strength of the  
474 current study is that using the CSAI-2R measures the intensity of anxiety within the  
475 environment during each condition. Situational aspects of stressors, such as intensity and  
476 controllability, have not been assessed in some research despite them being found to influence  
477 the individual's choice of coping response (Nichols & Polman, 2007). However, the CSAI-2R  
478 scale only measures the intensity of perceived somatic anxiety, cognitive anxiety and self-

479 confidence and does not specify the direction of which the participants interpret these  
480 symptoms (Jones, 1995; Hanton, Neil & Mellalieu, 2008). The direction has been suggested to  
481 be of greater importance to distinguish between group differences than the intensity of response  
482 (Jones & Hanton, 2001). Therefore, future research must look at the direction of competitive  
483 anxiety experienced in each condition in order to determine whether it is having a facilitative  
484 or debilitating effect upon performance. Furthermore, to assess the impact of a stressor and to  
485 ensure that a condition is eliciting higher levels of stress within participants, it is recommended  
486 that physiological variables are incorporated into future research (Whitehead et al., 2016). Such  
487 as heart rate monitors and or collecting salivary cortisol samples (Coetzee, 2011).

488         Despite differences in cognitive anxiety being found between conditions, tentative  
489 differences found between practice and competition could be due to the anxiety manipulation  
490 not being strong enough. Previous studies on stress and coping in sports have found differences,  
491 such as more intense stressors during competition (Nicholls, Levy, Grice & Polman, 2009).  
492 Though a competition situation was created using prizes and setting up an environment  
493 involving competitive characteristics, measurements of verbalisations during a real  
494 competition or with the use of greater monetary rewards may produce different results (Vine  
495 et al., 2011). One possible reason for tentative differences found between practice and  
496 competition despite an increase in cognitive anxiety can be explained by Individual Zones of  
497 Optimal Functioning (IZOF; Hanin, 1997, 2000). This states that individuals react to anxiety  
498 differently, with some performing optimally during high anxiety and some during low anxiety.  
499 Therefore, an increase in anxiety during competition may be facilitative for some players and  
500 not others leading to different stress and coping responses being elicited. To combat this in  
501 future research, a scale taking into account facilitative and debilitating anxiety should be  
502 implemented (Jones, Lane, Bray, Uphill & Catlin., 2005). Although cognitive anxiety may  
503 have been seen to increase significantly, this may have resulted in players experiencing  
504 facilitative effects. Therefore, some verbalised stressors may have the potential to increase  
505 performance not hinder it. This emphasises the need for athletes to be assessed individually on  
506 what facilitates their performance for future research.

507         It is important to acknowledge, specifically given the increasing literature on rigour  
508 within data analysis (Smith & McGannon, 2017) the potential limitations of using inter-rater  
509 reliability due to different coders utilizing the same text differently (Campbell, Quincy,  
510 Osserman, & Pedersen, 2013). Although this study has adopted a post-positive methodology,  
511 in line with previous TA literature, it is important to consider within future research, the

512 recommendations provided by Smith and McGannon (2017) and also Eccles and Arson (2017).  
513 These authors provide important suggestions for the use of alternative theoretical and  
514 philosophical lenses within this type of data moving forward. For example, Welsh et al, (2018)  
515 have provided an alternative approach to analysing this TA data in snooker.

### 516 *Conclusion and practical implications*

517 To conclude, findings show problem-focused coping as the most frequently utilised in tennis,  
518 supporting previous findings from other sports such as hockey (Kerdijk et al., 2016). Support  
519 for previous gender comparisons within stress and coping in sport has been found, showing  
520 gender differences occur only for the type of stress appraised, with differences in coping  
521 responses being due to different appraisals (Kaiseler et al., 2012; Lee-Baggley et al., 2005),  
522 and partial support for the situational hypothesis. The findings from this study extend the  
523 current stress and coping literature by examining an under-researched sport and utilising a  
524 novel method of TA. This study supports TA as a viable method to research cognitive thought  
525 and stress and coping in tennis. From a practical perspective, using TA to capture in event  
526 stress and coping responses can provide the coach and or the psychologist with extremely  
527 detailed accounts of how their athlete responds to stressors experienced in competition. In  
528 addition, although the competition was simulated, this process still demonstrated how a  
529 simulated environment can elicit higher or different stressors and responses, allowing for  
530 coaches and psychologists to gain access to this change in cognitive appraisal process in both  
531 males and females. This information should be taken into consideration by coaches or  
532 psychologists before coping interventions are implemented.

## References

- Aldwin, C. M. (2007). *Stress, coping, and development: An integrative approach*. New York: Guildford.
- Anshel, M. (1996). Coping styles among adolescent competitive athletes. *Journal of Social Psychology, 136*(3), 311-323. doi: 10.1080/00224545.1996.9714010
- Anshel, M. H. (2001). Qualitative validation of a model for coping with acute stress in sport. *Journal of Sport Behavior, 24*(3), 223-246.  
<https://www.cabdirect.org/cabdirect/abstract/20013116719>
- Anshel, M. H., & Wells, B. (2000). Sources of acute stress and coping styles in competitive sport. *Anxiety, stress and coping, 13*(1), 1-26. doi:10.1080/10615800008248331
- Anshel, M. H., Brown, J. M., & Brown, D. (1993). Effectiveness of an acute stress coping program on motor performance, muscular tension and affect. *Australian Journal of Science and Medicine in Sport, 25*, 7-16.  
<http://eds.b.ebscohost.com/eds/detail/detail?vid=7&sid=7009b98c-4137-4371-a70b-c3858ad8d7d7%40sessionmgr101&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=ed selc.2-52.0-0027281635&db=edselc>
- Anshel, M. H., Jamieson, J., & Raviv, S. (2001). Cognitive appraisals and coping strategies following acute stress among skilled competitive male and female athletes. *Journal of sport behavior, 24*(2), 128-143.  
<https://www.cabdirect.org/cabdirect/abstract/20013074608>
- Anshel, M. H., Williams, L. R. T., & Williams, S. M. (2000). Coping style following acute stress in competitive sport. *The Journal of Social Psychology, 140*(6), 751-773. doi: 10.1080/00224540009600515
- Arsal, G., Eccles, D. W., & Ericsson, K. A. (2016). Cognitive mediation of putting: Use of a think-aloud measure and implications for studies of golf-putting in the

- laboratory. *Psychology of sport and exercise*, 27, 18-27. doi:  
10.1016/j.psychsport.2016.07.008
- Baumeister, R. F. (1984). Choking under pressure: self-consciousness and paradoxical effects of incentives on skillful performance. *Journal of personality and social psychology*, 46(3), 610. doi: 10.1037/0022-3514.46.3.610
- Beilock, S. L., & Gray, R. (2007). Why do athletes choke under pressure?. *Handbook of sport psychology*, 425-444. doi: 10.1002/9781118270011.ch19
- Britton, D., Kavanagh, E., & Polman, R. (2017). The Perceived Stress Reactivity Scale for adolescent athletes. *Personality and Individual Differences*, 116, 301-308. doi:  
10.1016/j.paid.2017.05.008
- Bowers, K.S., Regehr, G., Balthazard, C., & Parker, K. (1990). Intuition in the context of discovery. *Cognitive Psychology*, 22, 72–110. doi: 10.1016/0010-0285(90)90004-N
- Brody, L. R., & Hall, J. A. (1993). Gender and emotion. In M. Lewis & J.M. Haviland (Eds.), *Handbook of emotions* (pp. 447-460). New York: Guilford Press.  
<http://psycnet.apa.org/record/1993-98937-025>
- Burgess, N. S., Knight, C. J., & Mellalieu, S. D. (2016). Parental stress and coping in elite youth gymnastics: an interpretative phenomenological analysis. *Qualitative Research in Sport, Exercise and Health*, 8(3), 237-256. doi: 10.1080/2159676X.2015.1134633
- Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. (2013). Coding in-depth semi structured interviews: Problems of unitization and intercoder reliability and agreement. *Sociological Methods and Research*, 42, 294–320. doi:  
10.1177/0049124113500475
- Coetzee, N. (2011). Measurement of heart rate variability and salivary cortisol levels in beginner scuba divers. *African Journal of Physical, Health Education, Recreation and Dance*, 17, 729–742.

[https://repository.up.ac.za/bitstream/handle/2263/18048/Coetzee\\_Measurement\\_2011.pdf?sequence=1](https://repository.up.ac.za/bitstream/handle/2263/18048/Coetzee_Measurement_2011.pdf?sequence=1)

- Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin*, *127*, 87–127. doi : 10.1037//0033-2909.127.1.87
- Cox, R. H., Martens, M. P., & Russell, W. D. (2003). Measuring anxiety in athletics: the revised competitive state anxiety inventory–2. *Journal of Sport and Exercise Psychology*, *25*(4), 519-533. doi: 10.1123/jsep.25.4.519
- Crocker, P. R., & Isaak, K. (1997). Coping during competitions and training sessions: Are youth swimmers consistent? *International Journal of Sport Psychology*, *28*(4), 355-369. <https://www.cabdirect.org/cabdirect/abstract/20023152502>
- Dancey, C., & Reidy, J. (2004). *Statistics without maths for psychology*. London: Prentice Hall.
- De Fruyt, F. (1997). Gender and individual differences in adult crying. *Personality and Individual Differences*, *22*(6), 937-940. doi: 10.1016/S0191-8869(96)00264-4
- Del Villar, F., González, L. G., Iglesias, D., Moreno, M. P., & Cervelló, E. M. (2007). Expert-novice differences in cognitive and execution skills during tennis competition. *Perceptual and Motor Skills*, *104*(2), 355-365. doi: 10.2466/pms.104.2.355-365
- Eccles, D. (2012). Verbal reports of cognitive processes. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Handbook of measurement in sport and exercise psychology*. (pp. 103-117). Champaign, IL: Human Kinetics.

- Eccles, D. W., & Arsal, G. (2017). The think aloud method: What is it and how do I use it? *Qualitative Research in Sport, Exercise and Health*, 9, 514–531. doi: doi.org/10.1080/2159676X.2017.1331501
- Ericsson, K. A., & Kirk, E. (2001). Instructions for giving retrospective verbal reports (Unpublished manuscript). Department of Psychology, Florida State University, Tallahassee, Florida, US
- Ericsson, K. A., & Simon, H. A. (1980). Verbal reports as data. *Psychological Review*, 87(3), 215-251. doi: 10.1037/0033-295X.87.3.215
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis*. Cambridge, MA: MIT Press.
- Fletcher, D., & Hanton, S. (2003). Sources of organizational stress in elite sports performers. *The sport psychologist*, 17(2), 175-195. doi: 10.1123/tsp.17.2.175
- Giacobbi, P., Foore, B., & Weinberg, R. S. (2004). Broken clubs and expletives: The sources of stress and coping responses of skilled and moderately skilled golfers. *Journal of Applied Sport Psychology*, 16(2), 166-182. doi: 10.1080/10413200490437688
- Gould, D., Finch, L. M., & Jackson, S. A. (1993). Coping strategies used by national champion figure skaters. *Research Quarterly for Exercise and Sport*, 64(4), 453-468. doi: 10.1080/02701367.1993.10607599
- Goyen, M. J., & Anshel, M. H. (1998). Sources of acute competitive stress and use of coping strategies as a function of age and gender. *Journal of Applied Developmental Psychology*, 19(3), 469-486. doi: 10.1016/S0193-3973(99)80051-3
- Grove, J. R., & Heard, N. P. (1997). Optimism and sport confidence as correlates of slump-related coping among athletes. *Sport Psychologist*, 11(4), 400-410. doi: 10.1123/tsp.11.4.400

- Hammermeister, J., & Burton, D. (2001). Stress, appraisal, and coping revisited: Examining the antecedents of competitive state anxiety with endurance athletes. *Sport Psychologist, 15*(1), 66-90. doi: 10.1123/tsp.15.1.66
- Haney, C. J., & Long, B. C. (1995). Coping Effectiveness: A Path Analysis of Self-Efficacy, Control, Coping, and Performance in Sport Competitions. *Journal of Applied Social Psychology, 25*(19), 1726-1746. doi: doi.org/10.1111/j.1559-1816.1995.tb01815.x
- Hanin, Y. L. (1997). Emotions and athletic performance: Individual zones of optimal functioning model. *European Yearbook of Sport Psychology, 1*, 29-72.
- Hanin, Y. L. (2000). Successful and poor performance and emotions. In Y. L. Hanin (Ed.). *Emotions in sport* (pp. 157-187). Champaign, IL: Human Kinetics.  
<http://psycnet.apa.org/record/1999-04265-007>
- Hanton, S., Neil, R., & Mellalieu, S. D. (2008). Recent developments in competitive anxiety direction and competition stress research. *International Review of Sport and Exercise Psychology, 1*(1), 45-57. doi: 10.1080/17509840701827445
- Hertzum, M., Hansen, K.D., Anderson, H.H.K. (2009). Scrutinizing usability evaluation: Does thinking aloud affect behaviour and mental workload? *Behaviour & Information Technology, 28*(2), 165-181. doi: doi.org/10.1080/01449290701773842
- Hill, D. M., Hanton, S., Matthews, N., & Fleming, S. (2010). Choking in sport: A review. *International Review of Sport and Exercise Psychology, 3*(1), 24-39. doi: 10.1080/17509840903301199
- Holt, N. L., & Hogg, J. M. (2002). Perceptions of stress and coping during preparations for the 1999 women's soccer world cup finals. *Sport Psychologist, 16*(3), 251-271. doi: 10.1123/tsp.16.3.251

- Jones, G. (1995). More than just a game: Research developments and issues in competitive anxiety in sport. *British Journal of Psychology*, 86, 449-478. doi: 10.1111/j.2044-8295.1995.tb02565.x
- Jones, G., & Hanton, S. (2001). Pre-competitive feeling states and directional anxiety interpretations. *Journal of Sports Sciences*, 19(6), 385-395. doi: 10.1080/026404101300149348
- Jones, M. V., Lane, A. M., Bray, S. R., Uphill, M., & Catlin, J. (2005). Development and validation of the Sport Emotion Questionnaire. *Journal of Sport and Exercise Psychology*, 27(4), 407-431. doi: 10.1123/jsep.27.4.407
- Kaiseler, M., Polman, R. C., & Nicholls, A. R. (2012). Gender differences in Appraisal and Coping: An examination of the situational and dispositional hypothesis. *International Journal of Sport Psychology*, 43(1), 1-14.  
<http://eds.b.ebscohost.com/eds/detail/detail?vid=11&sid=7009b98c-4137-4371-a70b-c3858ad8d7d7%40sessionmgr101&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=000302592100001&db=edswsc>
- Kerdijk, C., van der Kamp, J., & Polman, R. (2016). The influence of the social environment context in stress and coping in sport. *Frontiers in psychology*, 7(875). doi: 10.3389/fpsyg.2016.00875.
- Konietschke, F., Bathke, A. C., Harrar, S. W., & Pauly, M. (2015). Parametric and nonparametric bootstrap methods for general MANOVA. *Journal of Multivariate Analysis*, 140(C), 291-301. doi: 10.1016/j.jmva.2015.05.001
- Kowalski, K. C., Crocker, P. R., Hoar, S. D., & Niefer, C. S. (2005). Adolescents' control beliefs and coping with stress in sport. *International Journal of Sport Psychology*, 36(4), 257-272. <http://psycnet.apa.org/record/2006-03854-001>

- Lagos, L., Vaschillo, E., Vaschillo, B., Lehrer, P., Bates, M., & Pandina, R. (2008). Heart Rate Variability Biofeedback as a Strategy for Dealing with Competitive Anxiety: A Case Study. *Biofeedback*, 36(6), 109-115.  
[http://www.drleahlagos.com/docs/biof\\_heart\\_rate-1-Dr.%20Lagos.pdf](http://www.drleahlagos.com/docs/biof_heart_rate-1-Dr.%20Lagos.pdf)
- LaFrance, M., & Banaji, M. (1992). Toward a reconsideration of the gender-emotion relationship. *Emotion and Social Behavior*, 14, 178-201.  
[http://www.people.fas.harvard.edu/~mrbworks/articles/1992\\_MSCLARK.pdf](http://www.people.fas.harvard.edu/~mrbworks/articles/1992_MSCLARK.pdf)
- Lazarus, R. S. (2000). How emotions influence performance in competitive sports. *The sport psychologist*, 14(3), 229-252. doi: 10.1123/tsp.14.3.229
- Lazarus, R. S. (1999). The cognition-emotion debate: A bit of history. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 3-19). New York: John Wiley.
- Lazarus, R. S., & Folkman, S. (1984). Coping and adaptation. In W. D. Gentry (Ed.). *The handbook of behavioral medicine* (pp. 282-325). New York: Guilford.
- Lee-Baggley, D., Preece, M., & DeLongis, A. (2005). Coping with interpersonal stress: Role of Big Five traits. *Journal of Personality*, 73(5), 1141-1180. doi: 10.1111/j.1467-6494.2005.00345.x
- Levy, A. R., Nicholls, A. R., & Polman, R. C. J. (2011). Pre-competitive confidence, coping, and subjective performance in sport. *Scandinavian Journal of Medicine & Science in Sports*, 21(5), 721-729. Doi: 10.1111/j.1600-0838.2009.01075.x
- Martens, R., Vealey, R. S., & Burton, D. (1990). *Competitive anxiety in sport*. Champaign, IL: Human Kinetics.
- Masters, R. S. (1992). Knowledge, knerves and know-how: The role of explicit versus implicit knowledge in the breakdown of a complex motor skill under pressure. *British Journal of Psychology*, 83(3), 343-358. doi: 10.1111/j.2044-8295.1992.tb02446.x

- Maykut, P., Maykut, P. S., & Morehouse, R. (1994). *Beginning qualitative research: A philosophic and practical guide* (Vol. 6). London: Falmer Press.
- McPherson, S. L. (2000). Expert-novice differences in planning strategies during collegiate singles tennis competition. *Journal of Sport and Exercise Psychology*, 22(1), 39-62. doi: 10.1123/jsep.22.1.39
- McPherson, S. L., & Kernodle, M. (2007). Mapping two new points on the tennis expertise continuum: Tactical skills of adult advanced beginners and entry-level professionals during competition. *Journal of Sports Sciences*, 25(8), 945-959. doi: 10.1080/02640410600908035
- McRobert, A. P., Williams, A. M., Ward, P., Eccles, D. W., & Ericsson, K. A. (2007). Contextual information and anticipation skill in cricket batting. *Journal of Sport & Exercise Psychology*, 29(4), 457-478. <http://eds.b.ebscohost.com/eds/detail/detail?vid=2&sid=7009b98c-4137-4371-a70b-c3858ad8d7d7%40sessionmgr101&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=25216440&db=s3h>
- Mosewich, A. D., Crocker, P. R., Kowalski, K. C., & Besenski, L. J. (2010). Coping: Research design and analysis issues. In A.R Nicholls (Ed.), *Coping in Sport: Theory, Methods, and Related Constructs*, (pp.35-52). Hauppauge, NY: Nova Science.
- Nicholls, A. R., & Polman, R. C. (2007). Coping in sport: A systematic review. *Journal of Sports Sciences*, 25(1), 11-31. doi: 10.1080/02640410600630654
- Nicholls, A. R., & Polman, R. C. (2008). Think aloud: Acute stress and coping strategies during golf performances. *Anxiety, Stress, & Coping*, 21(3), 283-294. doi: doi.org/10.1080/10615800701609207
- Nicholls, A. R., Levy, A. R., Grice, A., & Polman, R. C. (2009). Stress appraisals, coping, and coping effectiveness among international cross-country runners during training

- and competition. *European Journal of Sport Science*, 9(5), 285-293. doi:  
10.1080/17461390902836049
- Nicholls, A. R., Jones, C. R., Polman, R. C. J., & Borkoles, E. (2009). Acute sport-related stressors, coping, and emotion among professional rugby union players during training and matches. *Scandinavian Journal of Medicine & Science in Sports*, 19(1), 113-120. doi: 10.1111/j.1600-0838.2008.00772.x
- Nicholls, A. R., Polman, R., Levy, A. R., Taylor, J., & Cobley, S. (2007). Stressors, coping, and coping effectiveness: Gender, type of sport, and skill differences. *Journal of Sports Sciences*, 25(13), 1521-1530. doi: 10.1080/02640410701230479
- Ntoumanis, N., & Biddle, S. J. (1998). The relationship of coping and its perceived effectiveness to positive and negative affect in sport. *Personality and Individual Differences*, 24(6), 773-788. doi: 10.1016/S0191-8869(97)00240-7
- NVivo (2015). Qualitative data analysis software. QSR International.
- Puente-Díaz, R., & Anshel, M. H. (2005). Sources of acute stress, cognitive appraisal, and coping strategies among highly skilled Mexican and US competitive tennis players. *Journal of Social Psychology*, 145(4), 429-446. doi:  
10.3200/SOCP.145.4.429-446
- Rosario, M., Shinn, M., Morch, H., & Huckabee, C. B. (1988). Gender differences in coping and social supports: Testing socialization and role constraint theories. *Journal of Community Psychology*, 16, 55-69. doi: 10.1002/1520-6629(198801)16:1
- Samson, A., Simpson, D., Kamphoff, C., & Langlier, A. (2017). Think aloud: An examination of distance runners' thought processes. *International Journal of Sport and Exercise Psychology*, 15(2), 176-189. doi: 10.1080/1612197X.2015.1069877
- Schmidt, R. A., & Wrisberg, C. A. (2004). Motor learning and performance. Champaign, IL: Human Kinetics.

- Smith, R. E., Leffingwell, T. R., & Ptacek, J. T. (1999). Can people remember how they coped? Factors associated with discordance between same-day and retrospective reports. *Journal of Personality and Social Psychology*, 76(6), 1050-1061. doi: 10.1037/0022-3514.76.6.1050
- Smith, B., & McGannon, K. R. (2017). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*. Advance online publication. doi: 10.1080/1750984X.2017.1317357
- Tamres, L. K., Janicki, D., & Helgeson, V. S. (2002). Sex differences in coping behavior: A meta-analytic review and an examination of relative coping. *Personality and Social Psychology Review*, 6(1), 2-30. doi: 10.1207/S15327957PSPR0601\_1
- Thelwell, R. C., Weston, N. J., & Greenlees, I. A. (2007). Batting on a sticky wicket: Identifying sources of stress and associated coping strategies for professional cricket batsmen. *Psychology of Sport and Exercise*, 8(2), 219-232. doi: 10.1016/j.psychsport.2006.04.002
- Vine, S. J., & Wilson, M. R. (2010). Quiet eye training: Effects on learning and performance under pressure. *Journal of Applied Sport Psychology*, 22(4), 361-376. doi: 10.1080/10413200.2010.495106
- Vine, S. J., Moore, L. J., & Wilson, M. R. (2011). Quiet eye training facilitates competitive putting performance in elite golfers. *Frontiers in psychology*, 2(8), 1-9. doi: 10.3389/fpsyg.2011.00008
- Wegner, D.M. (1994). Ironic processes of mental control. *Psychological Review*. 101, 34–52. doi: 10.1037/0033-295X.101.1.34
- Weisburd, D. (2000). Randomized experiments in criminal justice: prospects and problems. *Crime and Delinquency*, 46, 181–193. doi: 10.1177/0011128700046002003

- Welsh, J.C., Dewhurst, S.A., Perry, J.L. (2018). Thinking Aloud: An exploration of cognitions in professional snooker, *Psychology of Sport & Exercise*, 36, 197-208. doi: 10.1016/j.psychsport.2018.03.003.
- Whitehead, A. E., Jones, H. S., Williams, E. L., Dowling, C., Morley, D., Taylor, J. A., & Polman, R. C. (2017). Changes in cognition over a 16.1 km cycling time trial using Think Aloud protocol: Preliminary evidence. *International Journal of Sport and Exercise Psychology*, Advance online publication. doi: 10.1080/1612197X.2017.1292302
- Whitehead, A.E., Jones, H.S., Williams, E.L., Rowley, C., Quayle, L., Marchant, D., & Polman, R.C. (2018). Investigating the relationship between cognitions, pacing strategies and performance in 16.1 km cycling time trials using a think aloud protocol. *Psychology of Sport and Exercise*, 34, 95-109. doi: 10.1016/j.psychsport.2017.10.001
- Whitehead, A. E., Taylor, J. A., & Polman, R. C. (2015). Examination of the suitability of collecting in event cognitive processes using Think Aloud protocol in golf. *Frontiers in Psychology*, 6:1083. doi: 10.3389/fpsyg.2015.01083
- Whitehead, A. E., Taylor, J. A., & Polman, R. C. (2016). Evidence for skill level differences in the thought processes of golfers during high and low pressure situations. *Frontiers in Psychology*, 6:1974. doi: 10.3389/fpsyg.2015.01974
- Yoo, J. (2001). Coping profile of Korean competitive athletes. *International Journal of Sport Psychology*, 32(3), 290-303.  
<http://eds.b.ebscohost.com/eds/detail/detail?vid=14&sid=7009b98c-4137-4371-a70b-c3858ad8d7d7%40sessionmgr101&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=edselec.2-52.0-0011554660&db=edselec>