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3 **Self-talk and Emotions in Tennis Players During Competitive Matches**

4 **Abstract**

5 A theory-driven classification recently introduced to sport psychology distinguishes between
6 goal-directed self-talk as a controlled type of self-talk, and spontaneous self-talk as an
7 uncontrolled type of self-talk. Based on this classification, the aim of this study was to explore
8 the relationship between self-talk and emotions. To this end, twenty competitive tennis
9 matches were video-recorded. Shortly after the match, the players were confronted with
10 situations from the match and asked to rate the intensity of their emotions experienced, the
11 intensity of their outward emotional reactions, and to report on their self-talk. Multilevel fixed
12 and random effect models showed that the intensity of emotions experienced (fixed model: β
13 = -1.40; $p < .01$; random model: $\beta = -1.40$; $p < .01$) and outward emotional reactions (fixed
14 model: $\beta = -0.79$; $p < .01$; random model: $\beta = -0.76$; $p < .05$) were lower in instances where
15 players reported solely goal-directed self-talk than in instances where players reported solely
16 spontaneous self-talk. Moreover, in the fixed model, the intensity of emotions experienced
17 was also lower in instances where players reported goal-directed self-talk in conjunction with
18 spontaneous self-talk, compared to instances where players reported solely spontaneous self-
19 talk ($\beta = -0.46$; $p < .01$). Finally, exploratory analyses suggest that these effects are mostly
20 true for negative emotions rather than positive ones. Overall, the findings support the
21 relevance of dual-process self-talk approaches. These findings encourage players to gain
22 awareness about their emotions through spontaneous self-talk, while they can use goal-
23 directed self-talk for emotion regulation.

24 **Lay summary**

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25 During a match, most tennis players talk a lot to themselves. This study shows that their self-
26 talk is related to (a) the emotions they experience and (b) the emotions they show to the
27 outside. Specifically, a goal-oriented type of self-talk is related to less intense emotions.

28 **Implications for practice**

- 29 • Players can gain awareness about their emotional states through spontaneous self-talk.
- 30 • Players can use goal-directed self-talk to proactively and reactively regulate emotions.
- 31 • Video-assisted recall can be helpful to assess and learn to deal with challenging
32 psychological states during sport competitions.

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49 **Self-talk and Emotions in Tennis Players During Competitive Matches**

50 Research on self-talk in sport psychology has received increasing attention in recent
51 years, as shown by the publications of a book about self-talk in sport (Latinjak &
52 Hatzigeorgiadis, 2020) and a special issue of a sport psychology journal (Hardy et al., 2018).
53 An important development is the transition from purely data-driven approaches (e.g.,
54 Zourbanos et al., 2009) to theory-driven approaches, which have brought innovative ideas into
55 the field and seem useful in exploring the inherent relationship of self-talk with other
56 psychological constructs, including emotions (Latinjak, Hatzigeorgiadis et al., 2019; Van
57 Raalte et al., 2016). These theory-driven approaches, based on dual-process theories (e.g.,
58 Furley, Schweizer et al., 2015), distinguish between uncontrolled self-talk, which reflects
59 underlying psychological processes, and controlled self-talk, which is effortful and
60 intentionally used for self-regulation (Latinjak, Hatzigeorgiadis et al., 2019; Van Raalte et al.,
61 2016). Because the two types of self-talk appear to be related differently to emotions (Latinjak
62 et al., 2017; Latinjak et al., 2014), the aim of the current study was to investigate goal-directed
63 and spontaneous self-talk, comparatively, in relation to emotions in a sport competition.

64 In sport psychology, the term *self-talk* refers to “verbalizations addressed to the self,
65 overtly or covertly, characterized by interpretative elements associated to their content; and it
66 also either (a) reflects dynamic interplays between organic, spontaneous, and goal-directed
67 cognitive processes or (b) conveys messages to activate responses through the use of
68 predetermined cues developed strategically, to achieve performance-related outcomes.”
69 (Latinjak, Hatzigeorgiadis et al., 2019; p. 11). The definition identifies two distinct entities of

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70 self-talk, which are also reflected in self-talk research: *strategic self-talk*, on the one hand,
71 which involves the implementation of pre-determined self-talk plans mostly to enhance
72 performance (for a meta-analysis see Hatzigeorgiadis et al. , 2011) and *organic self-talk*, on
73 the other hand, referring to players' inherent thoughts before, during, and after sport practice
74 (Latinjak, Hatzigeorgiadis, et al., 2019). With regard to organic self-talk, the definition further
75 distinguishes between spontaneous and goal-directed self-talk, which reflects the
76 aforementioned classification of controlled and uncontrolled types of self-talk (Latinjak et al.,
77 2014).

78 Spontaneous self-talk is a type of uncontrolled self-talk and consists of unintended,
79 non-working, and non-instrumental statements that come to mind unbidden and effortlessly
80 (Christoff et al., 2011). Importantly, spontaneous self-talk is related to the activity at hand in
81 the current context. This distinguishes it from other types of uncontrolled self-talk, such as
82 mind-wandering, which is unrelated to the context (e.g., thinking about work during practice),
83 and stimulus-independent thoughts, which are related to current context, yet unrelated to the
84 ongoing activity (e.g., thinking about training during a match; Latinjak et al., 2014). Research
85 in the sport context has shown that spontaneous self-talk is often about predicting future
86 outcomes (e.g., "I will lose") or evaluating past events (e.g., "that was a great shot"), implying
87 an emotional connotation (Latinjak et al., 2014). Here, it is interesting to note that
88 spontaneous self-talk varies in terms of valence, which ranges from positive to negative, and
89 in terms of time-perspective, which ranges from retrospective to anticipatory (Latinjak et al.,
90 2017; Latinjak et al., 2014). The fact that core affect underlying emotional processes can be
91 similarly classified (Latinjak, 2012; Russell, 1980) points to the inherent relationship between
92 spontaneous self-talk and emotions (Latinjak et al., 2014; Van Raalte et al., 2016). This
93 relationship has also been evidenced in studies conducted before introducing the distinction
94 between spontaneous and goal-directed self-talk to sport psychology, showing a correlation

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95 between the valence of self-talk and affect (Hardy et al., 2001), or between negative self-talk
96 and cognitive as well as somatic anxiety (Zourbanos et al., 2009).

97 Goal-directed self-talk is a controlled type of self-talk that is deliberately used to solve
98 a problem or make progress on a task and thus transform current states into desired states
99 (Christoff et al., 2011; Unterrainer & Owen, 2006). In light of the impact emotions can have
100 on an individual's goal attainment (Hanin, 2007), it is important to note that emotion
101 regulation is considered a key function of goal-directed self-talk (Latinjak et al., 2014).
102 Studies assessing strategic self-talk interventions have shown that the planned use of self-talk
103 cues can decrease anxiety (Hatzigeorgiadis et al., 2007, 2009; Walter et al., 2019). Looking at
104 the mechanisms of how goal-directed self-talk can regulate emotions, it can directly deal with
105 debilitating emotions (e.g., "no need to be afraid") or promote adaptive emotions (e.g., "stay
106 calm"). However, goal-directed self-talk can also have other functions, such as giving
107 instructions (e.g., "bend your knee"), or directing attention (e.g., "focus on the next point"),
108 which may have an indirect influence on emotions (Latinjak et al., 2014). For instance, by
109 directing the focus on the task at hand, goal-directed self-talk diverts the attention away from
110 a potentially emotional stimulus, which in turn reduces the intensity of an emotion or even
111 prevents its occurrence (Gross, 2015).

112 In sport psychology, research on emotions has focused primarily on the subjective
113 experience and the associated intrapersonal processes of emotions (Hanin, 2007). However,
114 the fact that table tennis players reported to intentionally either conceal or pretend outward
115 emotional reactions (e.g., facial expressions, gestures, postures, verbalizations) highlights how
116 the behavioral component of emotions can differ from the subjective emotion experience
117 (Sève et al., 2007). The distinction of the behavioral component of emotions from the
118 subjective emotion experience points to the importance of explicitly considering the
119 interpersonal consequences of outward emotional reactions (Tamminen & Bennett, 2017).

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120 Noticeably, various experimental studies have shown that positive outward emotional
121 reactions decrease, and negative outward emotional reactions increase, the self-confidence of
122 the opponent (e.g., Furley, Moll et al. , 2015; Furley & Schweizer, 2014). For this reason, in
123 examining the links between self-talk and emotions, we considered both emotions
124 experienced and outward emotional reactions.

125 Summarizing the above, the introduction of theory-driven conceptualizations of self-
126 talk has significantly advanced the field of self-talk (Latinjak et al., 2014; Van Raalte et al.,
127 2016). One strength of these theory-driven conceptualizations is the ability to make testable
128 assumptions about the relationship between self-talk and other psychological constructs, such
129 as emotions (Latinjak, Hatzigeorgiadis, et al., 2019). The purpose of the current study was to
130 assess whether spontaneous self-talk and goal-directed self-talk are differently associated with
131 the intensity of emotions experienced as well as the intensity of outward emotional reactions.
132 Because, on the one hand, goal-directed self-talk is a controlled and rational type of self-talk,
133 with emotion regulation as one of its main functions, and, on the other hand, spontaneous self-
134 talk is a type of uncontrolled and often emotionally charged self-talk (Latinjak et al., 2014;
135 Van Raalte et al., 2016), we hypothesized that the intensity of (a) emotions experienced and
136 (b) outward emotional reactions would be lower in instances where players reported goal-
137 directed self-talk (either solely or in conjunction with spontaneous self-talk) compared to
138 instances they reported solely spontaneous self-talk. Because individuals' positive and
139 negative emotions differ, between them, in subjective experiences, cognitive appraisal
140 processes, and behavioral tendencies (Green, 1992), we explored whether the identified
141 relationships between self-talk and emotions experienced as well as outward emotional
142 reactions were evident for both positive and negative emotions.

143 **Methods**

144 *Sampling & participants*

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145 Tennis was chosen as the sport of choice because the time between the points offers
146 many opportunities for players to experience and display self-talk and emotions. After the
147 ethical approval by the university's ethics committee, tennis players were contacted through
148 representatives of clubs, tennis coaches, or friends. In total, 20 tennis players (7 female)
149 agreed to participate in the study. Fourteen players were from Germany and six from
150 Denmark. They were on average 23.10 years old ($SD = 4.88$), had played tennis for an
151 average of 14.70 years ($SD = 5.58$), and had taken part in tennis competitions for an average
152 of 10.85 years ($SD = 4.91$). The current level of the players ranged from regional ($n = 10$) to
153 national ($n = 6$), and international ($n = 4$). Furthermore, the players stated to have played as
154 seniors at the regional ($n = 8$), national ($n = 2$), or international ($n = 7$) level and as juniors at
155 the regional ($n = 8$), or international ($n = 11$) level as the highest level they had ever played.
156 Three players were still at the junior level and one player had only started playing tennis at the
157 senior level. The players trained on average 3.25 ($SD = 1.67$) days or 8.35 ($SD = 8.78$) hours
158 per week.

159 *Procedure*

160 A naturalistic video-assisted approach was chosen, which has been shown to be
161 effective in studying the relationship between self-talk and other psychological processes,
162 such as emotions, in real sport competitions (Latinjak, Hardy et al., 2019; Miles & Neil,
163 2013). All matches included in this study were either part of the regular season or an official
164 tournament. Following a naturalistic video-assisted approach (e.g., Miles & Neil, 2013), first,
165 the participating player was recorded with two cameras during a tennis match. A GoPro
166 Action Camera Hero was placed behind the court so the entire court, including the trajectories
167 of the ball and the movement of both players, could be recorded. The purpose of the
168 recordings from this camera was to stimulate the players' memories of specific points after
169 the match. The second camera (a digicam) was positioned next to the court, near to the net

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170 and directed towards the participating player. The lens of the camera was repositioned
171 towards the appropriate court side each time the player changed sides during the match. The
172 recording from this camera was not only supposed to support the memory of the players, but
173 also capture their outward emotional reactions. To reduce self-presentational bias, players
174 were told before the match that the study would investigate psychological processes during
175 tennis matches, but the explicit focus on emotions and self-talk was not mentioned. In line
176 with the researcher's observations, after the match, the players unanimously affirmed that due
177 to the competitive nature of the match the fact that they were recorded did not influence their
178 behavior.

179 Thereafter, the first author of the study met with the player to conduct an interview,
180 using the footage. The preferred option for the interview was one day after the competition to
181 increase the accuracy of players' memories of their self-talk and emotions (Martinet &
182 Ferrand, 2009). It was decided not to conduct the interviews on the same day of the
183 competition, if this timing was feasible for participants, because (a) the preparation of each
184 interview, including the selection of rallies and the preparation of the footage, took about
185 three hours, and (b) the players were often physically and mentally exhausted after the
186 competition. In total, one interview took place on the same day of competition, 17 interviews
187 the day after the competition, and two interviews two days after competition ($M_{\text{hours}} = 22.65$;
188 $SD = 9.23$). The interviewer made a pre-selection of 20 won and 20 lost rallies from the
189 match. Instead of focusing on specific emotions (e.g., anger, anxiety), as was the case in
190 previous studies (e.g., Latinjak et al., 2017), the study broadly assessed positive and negative
191 emotions, thus considering a wider range of emotional states (Ekkekakis, 2013). Based on his
192 subjective perception, the interviewer tried to select (a) ten rallies in which the players won a
193 point and showed a positive outward emotional reaction, (b) ten rallies in which the players
194 won a point and remained neutral, (c) ten rallies in which the players lost a point and showed

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195 a negative outward emotional reaction, and (d) ten rallies in which the players lost a point and
196 remained neutral. However, for some players, the interviewer could not identify ten rallies in
197 which the player showed a negative or a positive outward emotional reaction. Furthermore, it
198 is important to emphasize that the pre-selection of points by the researcher had no direct
199 influence on the statistical analyses because in the interview the players had to assess their
200 emotions themselves.

201 During the individual interviews, the players were shown the forty rallies one after the
202 other. After the players had seen a rally from both camera angles, they first had to indicate
203 whether they could recall the rally on a scale of 1 (not at all) to 7 (very clearly). In view of the
204 context dependence of one's own memory (Smith & Vela, 2001), the current score and
205 outcome of the previous points were given as additional information. If the players' response
206 was 1, this rally was skipped and the next rally was shown. If the players' response was 2 or
207 3, the interviewer asked once more whether the players could actually recall the point and
208 encouraged them to move on to the next point, if they were not confident about their memory.
209 Only when the players confirmed that they recalled the point, further questions about
210 emotions and self-talk were asked. Because the players were shown a large number of
211 situations, single-item scales were used to measure the intensity of emotions experienced and
212 outward emotional reactions (Ekkekakis, 2013). First, the players stated whether they had
213 experienced no emotion, a positive emotion, or a negative emotion after the rally. If they
214 reported experiencing a positive or a negative emotion, they were asked to state its intensity
215 (from 1 = very low to 7 = very high). If they stated they had experienced no emotion, the
216 intensity was regarded as 0. In addition, the players were then also asked to state whether they
217 recognized no outward emotional reaction, a positive outward emotional reaction, or a
218 negative outward emotional reaction after the rally, and, in case of a positive or negative
219 outward emotional reaction, state the intensity of the outward emotional reaction (from 1 =

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220 very low to 7 = very high). Again, if they stated they had recognized no outward emotional
221 reaction, the intensity was regarded as 0. Given the inter-individual differences in one's
222 emotionality (Reisenzein & Weber, 2009), we asked the players to take their usual emotion
223 experiences/outward emotional reactions as a reference point. Finally, the players were asked
224 whether they could recall their thoughts and the things they had said to themselves
225 immediately after the rally on a scale of 1 (not at all) to 7 (very clearly). Similar to the recall
226 of the rally, if the players' response was 1, players did not write down any self-talk and the
227 next rally was shown. If the players' response was 2 or 3, the interviewer asked once more
228 whether the players could actually recall their self-talk and encouraged them to move on to
229 the next point if they were not confident about their memory. Only when the players
230 confirmed that they recalled their self-talk, were they asked to write it down. Here, the players
231 were explicitly asked to quote their thoughts as concretely as possible, avoiding any attempt
232 to evaluate or explain them. The players were also encouraged to write down several self-talk
233 statements if they could recall them.

234 *Self-talk categorization*

235 To prepare the data, the self-talk statements were broken down into individual text
236 units, which were defined as independent statements with significance on their own (Lyons,
237 1981). Two authors first went through the self-talk statements of five matches to ensure a
238 common understanding of what defines an independent text unit, followed by the first author
239 of the study who completed the procedure. This process resulted in 1242 individual text units
240 with an average of 1.92 individual units ($SD = 0.87$; Range = 1-5) per situation. Then, two
241 authors independently categorized all individual text units into *goal-directed self-talk*,
242 *stimulus-independent thoughts*, *mind-wandering*, and *spontaneous self-talk* based on the
243 definitions of Christoff (2012). Both authors had experience with qualitative research
244 methodology, and academic degrees in sport psychology, and one of the authors was an

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245 experienced tennis player. Given the interpretive element of self-talk (Hardy, 2006), the
246 content of some statements can be classified as either goal-directed or spontaneous self-talk
247 (Latinjak et al., 2014). For this reason, the coders had the possibility to classify those
248 individual text units as *either spontaneous self-talk or goal-directed self-talk* to leave them
249 open for discussion later. All individual text units on which the two authors disagreed, and
250 those on which at least one of the coders chose the category either *spontaneous self-talk or*
251 *goal-directed self-talk*, were discussed in order to agree on a final classification. This
252 procedure was supported by another author of the study. Because the relationship between
253 emotions and self-talk was analyzed at the level of the situation and many situations involved
254 more than one individual text unit, a score was calculated for each situation, taking into
255 account the occurrence of both spontaneous self-talk and goal-directed self-talk. Due to their
256 low frequency (1.5%), individual text units coded as mind-wandering or stimulus-independent
257 thoughts were not considered in this step. Finally, if a situation involved only spontaneous
258 self-talk, the situation was coded as “spontaneous self-talk,” if a situation involved only goal-
259 directed self-talk, the situation was coded as “goal-directed self-talk,” and if a situation
260 involved both spontaneous and goal-directed self-talk, the situation was coded as
261 “spontaneous/goal-directed self-talk.”

262 *Statistical analysis*

263 To test the relationship between the players’ emotions and their self-talk, we
264 conducted multilevel regression analyses using the statistical software SPSS (IBM), version
265 25.0. We calculated two-level models, where level 1 represented repeated measurements
266 during a match nested within the players (level 2). We set up two separate models in which
267 self-talk was entered as an independent variable (parameterized as a categorical variable with
268 three different values: goal-directed self-talk; spontaneous/goal-directed self-talk;
269 spontaneous self-talk). In the first model, the intensity of the emotions experienced, and in the

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270 second model, the intensity of the outward emotional reactions were the dependent variables.
 271 In light of the multilevel structure of the data, for both models we considered fixed and
 272 random effects models. In line with established procedures (Hox, 2010), all models included
 273 random intercepts, while random slopes were additionally introduced to explore whether the
 274 within-subject associations differed between the players. Random slopes were only reported
 275 when significant effects emerged (Bolger & Laurenceau, 2013). Because we found variance
 276 in the within-subjects effects (significant random effects, see results section), we report four
 277 models in total, two with fixed and two with random effects.

278 For the emotions experienced as a dependent variable, the two models with fixed (a)
 279 and random (b) effects are exemplified below:

280 (a) $Y(\text{Intensity of the emotion experience})_{ij} = \beta_{0j} + \beta_{1j} * (\text{self} - \text{talk})_{ij} + u_{0j} + r_{ij}$

281 (b) $Y(\text{Intensity of the emotion experience})_{ij} = \beta_{0j} + \beta_{1j} * (\text{self} - \text{talk})_{ij} + u_{0j} +$
 282 $u_{1j} + r_{ij}$

283 We estimated within-subjects effects of participants' (subscript j) self-talk in distinct
 284 situations (subscript i) at level 1. Accordingly, Y_{ij} represents the intensity of the emotion
 285 experienced in person j in situation i . The intercept is represented by β_{0j} and the beta
 286 coefficient of the categorical predictor self-talk by β_{1j} (spontaneous self-talk;
 287 spontaneous/goal-directed self-talk; goal-directed self-talk). Furthermore, the term r_{ij}
 288 represents the residual at level 1. Level 2 represents the between-person level, where we
 289 included a random intercept (u_{0j}) to account for differences in the emotion experienced
 290 between participants. In the second equation, the u_{1j} represents the random effects for the
 291 predictor self-talk.

292 In addition, in the case of a significant relationship, we continued to explore whether
 293 this effect applied to both positive and negative emotions. However, due to the reduced data

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294 points decreasing the statistical power in these analyses (Arend & Schäfer, 2019), we did not
 295 consider random effects for these models.

296 **Results**

297 *Memory of rallies and self-talk*

298 The players were shown a total of 782 rallies (392 won and 390 lost). Due to sudden
 299 events, one player had to stop the interview after having seen only 22 rallies. Of the 782
 300 rallies, players remembered 692 rallies (88.49%) after seeing them on video ($M = 34.5$; $SD =$
 301 5.91). On a scale of 1 (“I do not remember the point at all”) to 7 (“I remember the point very
 302 clearly”), the reported mean value of the players’ memory of the rallies was 5.04 ($SD = 2$). Of
 303 the 692 rallies they remembered, they recalled their self-talk after 645 rallies (93.21%) with
 304 an average of 32.3 rallies per player ($SD = 6.17$). On a scale of 1 (“I do not remember my self-
 305 talk at all”) to 7 (“I remember my self-talk very clearly”), the reported mean value of the
 306 players’ memory of the self-talk was 5.31 ($SD = 1.71$).

307 *Coding of self-talk statements*

308 The initial interrater-agreement between the two coders was 84.70 %. After the three
 309 authors convened, 686 individual text units were coded as spontaneous self-talk, 538
 310 individual text units as goal-directed self-talk, 8 individual text units as stimulus-independent
 311 thoughts, and 10 individual text units as mind-wandering. Consequently, out of a total of 645
 312 situations, 279 situations were coded *spontaneous* because they contained only spontaneous
 313 self-talk text units, 168 situations were coded as *goal-directed* as they contained only goal-
 314 directed self-talk text units, and 193 situations were coded as *spontaneous/goal-directed* as
 315 they contained both types of text units. Five situations were not included in the analysis
 316 because they included only stimulus-independent thoughts and/or mind-wandering.

317 *Hypotheses testing*

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318 The descriptive statistics for the intensity of both emotions experienced and outward
 319 emotional reactions in relation to players' self-talk are displayed in Table 1. For the
 320 interpretation of the results, it is important to note that situations were also included in which
 321 neither emotions experienced nor outward emotional reactions were reported. For this reason,
 322 the scale ranged from 0 (no emotion) to 7 (emotion with very high intensity). In case of a
 323 positive/negative emotion experienced or outward emotional reaction, the scale ranged from 1
 324 (emotion with very low intensity) to 7 (emotion with very high intensity).

325 *Hypothesis 1: The intensity of emotions experienced would be lower in instances where*
 326 *players reported goal-directed self-talk (either solely or in conjunction with spontaneous self-*
 327 *talk) compared to instances where they solely reported spontaneous self-talk.*

328 **Fixed effect model.** Using a fixed effect model, Model 1 in Table 2 shows that the intensity of
 329 emotions experienced was significantly lower in instances where players reported solely goal-
 330 directed self-talk compared to instances where they reported solely spontaneous self-talk ($\beta =$
 331 $-1.40, t(633.32) = -8.03, p < .01$). The results further showed that the intensity of emotions
 332 experienced was significantly lower in instances where players reported goal-directed self-
 333 talk in conjunction with spontaneous self-talk compared to instances where they reported
 334 solely spontaneous self-talk ($\beta = -0.46, t(634.55) = -2.71, p < .01$).

335 **Random effect model.** Using a random effect model, which took the extent to which the
 336 associations differ between subjects into account, Model 2 in Table 3 shows that the intensity
 337 of emotions experienced was significantly lower in instances where players reported solely
 338 goal-directed self-talk compared to instances where they reported solely spontaneous self-talk
 339 ($\beta = -1.40, t(34.40) = -5.83, p < .01$). However, there was no significant difference in the
 340 intensity of emotions experienced when comparing instances where players reported goal-
 341 directed self-talk in conjunction with spontaneous self-talk with instances where they reported
 342 solely spontaneous self-talk ($\beta = -0.38, t(32.04) = -1.61, p = .12$).

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343 **Exploratory analyses for positive and negative emotions.** Further exploratory analyses
 344 included a differentiation between positive and negative emotions. In the case of negative
 345 emotions (Model 1a in Table 2), the intensity of emotions experienced was significantly lower
 346 in instances where players reported solely goal-directed self-talk compared to instances where
 347 they reported solely spontaneous self-talk ($\beta = -1.00$, $t(311.98) = -4.69$, $p < .01$). Moreover,
 348 the intensity of emotions experienced was significantly lower in instances where players
 349 reported goal-directed self-talk in conjunction with spontaneous self-talk compared to
 350 instances where they reported solely spontaneous self-talk ($\beta = -0.87$, $t(308.84) = -4.10$, $p <$
 351 $.01$). In the case of positive emotions (Model 1b in Table 2), the model only approached
 352 significance ($\beta = -0.49$, $t(269.88) = -1.93$, $p = .06$) by showing that the intensity of emotions
 353 experienced was lower in instances where players reported solely goal-directed self-talk
 354 compared to instances where they reported solely spontaneous self-talk. However, the model
 355 showed no significant difference in the intensity of emotions experienced when comparing
 356 instances where players reported goal-directed self-talk in conjunction with spontaneous self-
 357 talk with instances where they reported solely spontaneous self-talk ($\beta = -0.12$, $t(272.87) = -$
 358 0.57 , $p = .57$).

359 *Hypothesis 2: The intensity of outward emotional reactions would be lower in instances*
 360 *where players reported goal-directed self-talk (either solely or in conjunction with*
 361 *spontaneous self-talk) compared to instances where they reported solely spontaneous self-*
 362 *talk.*

363 **Fixed effect model.** Using a fixed effect model, Model 3 in Table 4 shows that the intensity of
 364 outward emotional reactions was significantly lower in instances where players reported
 365 solely goal-directed self-talk compared to instances where they reported solely spontaneous
 366 self-talk ($\beta = -0.79$, $t(632.63) = -3.47$, $p < .01$). However, the model showed no significant
 367 difference in the intensity of outward emotional reactions when comparing instances where

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368 players reported goal-directed self-talk in conjunction with spontaneous self-talk with
369 instances where they reported solely spontaneous self-talk ($\beta = -0.27$, $t(627.48) = -1.22$, $p =$
370 $.22$).

371 **Random effect model.** Using a random effect model, which took the extent to which the
372 associations differed between subjects into account, Model 4 in Table 3 shows that the
373 intensity of outward emotional reactions was significantly lower in instances where players
374 reported solely goal-directed self-talk compared to instances where they reported solely
375 spontaneous self-talk ($\beta = -0.76$, $t(40.12) = -2.40$, $p < .05$). However, the model showed no
376 significant difference in the intensity of outward emotional reactions when comparing
377 instances where players reported goal-directed self-talk in conjunction with spontaneous self-
378 talk with instances where they reported solely spontaneous self-talk ($\beta = -0.25$, $t(37.49) = -$
379 0.79 , $p = .44$).

380 **Exploratory analyses for positive and negative emotions.** Further exploratory analyses
381 included a differentiation between positive and negative emotions. In the case of negative
382 emotions (Model 3a in Table 4), the intensity of outward emotional reactions was
383 significantly lower in instances where players reported solely goal-directed self-talk compared
384 to instances where they reported solely spontaneous self-talk ($\beta = -0.95$, $t(229.50) = -3.58$, $p <$
385 $.01$). However, the model showed no significant difference in the intensity of outward
386 emotional reactions when comparing instances where players reported goal-directed self-talk
387 in conjunction with spontaneous self-talk with instances where they reported solely
388 spontaneous self-talk ($\beta = -0.40$, $t(226.73) = -1.53$, $p = .13$). For positive emotions (Model 3b
389 in Table 4), the analyses showed that compared to instances where players reported solely
390 spontaneous self-talk, the intensity of outward emotional reactions was not significantly
391 different in instances where players reported solely goal-directed self-talk ($\beta = 0.16$, $t(166.97)$

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392 = 0.43, $p = .67$) nor in instances where players reported goal-directed self-talk in conjunction
 393 with spontaneous self-talk ($\beta = -0.61$, $t(166.08) = -0.20$, $p = .84$).

394 **Discussion**

395 The purpose of this study was to test whether goal-directed self-talk, as a controlled
 396 type of self-talk, and spontaneous self-talk, as an uncontrolled type of self-talk, are differently
 397 related to the intensity of emotions experienced as well as the intensity of outward emotional
 398 reactions. Overall, in line with our hypotheses, the results showed that, in situations in which
 399 the players reported solely goal-directed self-talk, the intensity of both emotions experienced
 400 and outward emotional reactions was significantly lower compared to situations in which
 401 players reported solely spontaneous self-talk. Moreover, the results showed that in situations
 402 in which players reported goal-directed self-talk in conjunction with spontaneous self-talk, the
 403 intensity of emotions experienced, but not of outward emotional reactions, was significantly
 404 lower compared to situations in which the players reported solely spontaneous self-talk.

405 Because spontaneous self-talk is often emotionally charged or an expression of
 406 emotions (Latinjak et al., 2014; Van Raalte et al., 2016), the findings are in line with the
 407 postulations of the dual-process theories of self-talk. Looking at the direction of the
 408 relationship between spontaneous self-talk and emotions, spontaneous self-talk is neither an
 409 antecedent nor a consequence of emotions, but can rather be regarded as an integral part of the
 410 emotion, just like changes in the subjective experience, observable behavior, or the peripheral
 411 nervous system (Russell, 2009). This assumption suggests that spontaneous self-talk cannot
 412 exist on its own, but reflects other psychological processes, such as emotions (Latinjak et al.,
 413 2014; Van Raalte et al., 2016). The inherent relationship between spontaneous self-talk and
 414 emotions is also indicated by Latinjak et al.'s (2017) study, revealing that athletes report
 415 more spontaneous than goal-directed self-talk in situations in which they experience anger or
 416 anxiety, which are both considered to be high intensity emotions (Russell, 1980).

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417 Although goal-directed self-talk can co-occur with emotions, our results suggest that
418 situations in which players have goal-directed self-talk are associated with a weak emotion
419 intensity compared to situations in which players have only spontaneous self-talk. It is
420 important to emphasize that our study design did not allow the assessment of the temporal
421 order of self-talk and emotions. Nevertheless, this finding is consistent with the theoretical
422 approaches considering emotion regulation as a main function of goal-directed self-talk
423 (Latinjak et al., 2014; Theodorakis et al., 2008). This relationship is further supported by
424 neuroscientific findings showing how cortical brain regions associated with cognitive
425 strategies influence subcortical regions associated with affective responses (Ochsner et al.,
426 2012). With regard to the specific mechanisms of how goal-directed self-talk regulates
427 emotions, goal-directed self-talk can either directly or indirectly influence emotions (Latinjak
428 et al., 2014). In relation to the former, goal-directed self-talk can deal with debilitating
429 emotions or promote adaptive emotions. Importantly, with relevance for the relationship
430 between self-talk and emotions, the promotion of adaptive emotions can also be associated
431 with an increase of the intensity of the emotion (e.g., “enjoy your game”), which is consistent
432 with the motivational function of goal-directed self-talk (Theodorakis et al., 2008). For the
433 indirect mechanisms of goal-directed self-talk, it can influence emotions by directing the
434 attention (e.g., “focus on your task”), controlling cognitive reactions (e.g., “anyone can make
435 mistakes”), or promoting new goals (e.g., “play better”; Latinjak, Torregrossa et al., 2019).
436 These strategies could be particularly functional when considering the possible ironic effects
437 of mental strategies that focus explicitly on the suppression of emotions (Wegner, 1994).
438 Given the impact of emotion on sport performance (Hanin, 2007), both from a theoretical and
439 applied perspective, future research that focuses on the effectiveness of the different functions
440 of goal-directed self-talk in relation to emotion regulation is warranted. It appears promising
441 to distinguish between goal-directed self-talk that focuses directly on emotions by trying to

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442 either increase debilitating emotions or increase adaptive emotions, and goal-directed self-talk
443 that indirectly influences emotions.

444 Furthermore, the results showed that, regarding emotions experienced, situations in
445 which players reported both spontaneous and goal-directed self-talk were associated with a
446 lower intensity of emotion compared to situations in which the players reported solely
447 spontaneous self-talk. Although it is important to note that this association was not found in
448 relation to outward emotional reactions, this finding points to the distinction between reactive
449 and proactive emotion regulation functions of goal-directed self-talk. Research indicates that
450 goal-directed self-talk is often the response to emotionally-charged spontaneous self-talk
451 (Latinjak, 2018). In this sense, goal-directed self-talk serves to reactively regulate potentially
452 debilitating effects of emotions brought into a player's awareness by spontaneous self-talk
453 (Latinjak et al., 2014). However, the finding of our study, that the difference in intensity of
454 emotion was bigger when comparing situations in which players reported solely goal-directed
455 self-talk to situations in which players reported solely spontaneous self-talk, illustrates the
456 potential of proactive emotion regulation. Thus, goal-directed self-talk might not only be
457 effective in regulating emotions and the associated spontaneous self-talk after it has occurred,
458 but could also proactively prevent the underlying psychological processes associated with the
459 spontaneous self-talk in the first place (Van Raalte et al., 2016).

460 The results of the study further indicate that self-talk is related to how the players
461 displayed the emotion to the outside world (i.e., outward emotional reaction). Although this
462 relationship was weaker compared to the one between self-talk and emotions experienced, this
463 result shows how self-talk is also related to observable behavior (Ellis, 2003). That self-talk is
464 at its core intrapersonal (Latinjak, Hatzigeorgiadis et al., 2019), explains why it was more
465 strongly related to the subjective experience of an emotion than to the observable behavior,
466 where additional factors play an important role (e.g., social rules, sport ethics). The social

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467 nature of outward emotional reactions are particularly relevant to understanding the
468 interpersonal consequences of emotions, which is an area with many unresolved research
469 questions in sport psychology (Tamminen & Bennett, 2017). Specifically, research shows that
470 outward emotional reactions can influence the opponent's confidence and the experience of
471 their own emotions (e.g., Furley, Moll, et al., 2015; Furley & Schweizer, 2014). Therefore,
472 creating awareness about the voice inside the head can be especially important for those
473 players who struggle with their outward emotional reactions during competitions.

474 Exploratory analyses showed that the relationship between self-talk and emotions is
475 more consistent when emotions are positive than negative. In particular, the results show
476 that for negative emotions the intensity of emotions experienced and outward emotional
477 reactions were lower in instances where players reported solely goal-directed self-talk
478 compared to instances where players reported solely spontaneous self-talk. In addition, when
479 comparing instances of spontaneous self-talk in conjunction with goal-directed self-talk, the
480 intensity of negative emotions experienced, but not of negative outward emotional reactions,
481 was significantly lower. For positive emotions, only the intensity of emotions experienced
482 was marginally lower in instances where players reported solely goal-directed self-talk
483 compared to situations where they reported solely spontaneous self-talk. The other
484 comparisons did not reveal significant differences. These results can be explained by the
485 findings from a study in table tennis showing that negative emotions are usually more difficult
486 to regulate than positive ones (Martinent et al, 2015). Thus, in negative situations, such as
487 losing a point, the regulation of negative emotions may need more cognitive control in the
488 form of goal-directed self-talk (e.g., "calm down"). In contrast, in positive situations, such as
489 winning a point, the use of goal-directed self-talk might be less aimed at emotion regulation
490 (e.g., "keep playing that way"), or might even be used to cultivate positive emotions (e.g.,
491 "you can do it"; Latinjak et al., 2014). This relationship between goal-directed self-talk and

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492 positive emotions is in line with the finding of our study that the intensity of positive outward
493 emotional reactions was highest in instances where players reported solely goal-directed self-
494 talk.

495 Importantly, the multilevel regression analyses showed some between-subject
496 differences, which generally affect the relationship between emotions and self-talk. While the
497 fixed effect model showed that in instances where players reported goal-directed self-talk in
498 conjunction with self-talk were associated with a lower intensity of emotions experienced
499 compared to instances where players reported spontaneous self-talk, this finding did not show
500 in the random effect model. This finding means that for some players goal-directed self-talk is
501 more strongly related to their emotions than for others. There are likely to be a wide range of
502 personal factors that can explain such individual differences in self-talk (Brinthead, 2019).
503 Understanding these individual differences does not only help to refine the theoretical
504 understanding of self-talk (Latinjak et al, 2014), but it also useful when tailoring a self-talk
505 intervention to the individual needs of a player. Of relevance for the relationship between
506 emotions and self-talk, research suggests that the tendency of experiencing anxiety is
507 associated with overall self-talk frequency (Khodayarifard et al., 2014). Another study
508 reported that in competition female basketball players used more goal-directed self-talk than
509 male players. Similarly, Akbari-Zardkhaneh et al. (2018) found that individuals who are more
510 introverted are more likely to report goal-directed self-talk. To conclude, our findings stress
511 the importance of individual differences in self-talk research, which up to now have received
512 relatively little attention, and support the idea that competitive sport is a suitable context for
513 such research (Brinthead, 2019).

514 *Practical implications*

515 The results of the study are also interesting from an applied perspective. Although it is
516 important to emphasize that undoubtedly both positive and negative emotions can have

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517 facilitative effects on performance (Hanin, 2007), in many situations players would benefit
518 from strategies that can regulate the emotions experienced as well as outward emotional
519 reactions. Importantly, in this study we asked players to report on their self-talk in general and
520 not explicitly what strategies they use to regulate emotions. Because we found a relationship
521 between self-talk and their emotions, we can assume that players often use strategies to
522 regulate emotions, even though at times they may not consciously perceive them as emotion
523 regulation strategies (Lane et al., 2012). In connection with the study of organic self-talk and
524 the recognition of the psychologist within as an inherent part of every player, reflexive self-
525 talk interventions have been proposed as an alternative to traditional strategic self-talk
526 interventions (Latinjak, Hernando-Gimeno et al. 2019). While in strategic self-talk
527 interventions players normally use predetermined self-talk plans that should trigger
528 appropriate responses (Hatzigeorgiadis et al., 2011), in reflexive self-talk interventions,
529 players are guided to become aware of the content, antecedents, and consequences of their
530 organic self-talk (Latinjak, Hernando-Gimeno, et al., 2019). In particular, the analysis of
531 organic spontaneous self-talk can help to identify the situational conditions and the related
532 emotional processes that lead to potentially dysfunctional spontaneous self-talk.
533 Consequently, players can learn how to change the situational conditions and/or learn to apply
534 functional goal-directed self-talk to regulate the related emotional processes (Latinjak,
535 Hatzigeorgiadis, et al., 2019). Because our study shows the potential of the strategies inherent
536 in the player, in the long run reflexive self-talk interventions with more self-determined
537 strategies could be useful to lead to more functional organic self-talk and associated emotional
538 processes.

539 *Strengths and limitations*

540 Among the strengths of this study is that it is based on recent theoretical developments
541 in self-talk, distinguishing between spontaneous and goal-directed self-talk (Latinjak et al.,

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542 2014). The findings linking the different self-talk types with different emotions experienced
543 and outward emotional reactions provide reasonable support for the new self-talk
544 conceptualization. Another strength of the study is that the data were collected in real sport
545 competitions, thus addressing a major limitation specific to the self-talk literature (Hardy et
546 al., 2018) and also to the sport psychology literature in general (Martin et al., 2005). This
547 methodological approach gives us confidence that the results are relevant to those situations in
548 which players need to perform under pressure as an integral part of sport competitions.

549 Despite these strengths, there are some limitations in our study that ought to be
550 discussed. First, the design of the correlational study does not allow for causal interpretations
551 regarding the direction of the relationship between self-talk and emotions. Whereas
552 spontaneous self-talk can be regarded as an integral part of emotions, studies with a rigorous
553 experimental design are required, particularly with regard to the assumed emotion regulation
554 functions of goal-oriented self-talk (Latinjak et al., 2014; Van Raalte et al., 2016). Second,
555 although the naturalistic video-assisted procedure of our study has a high ecological validity
556 (Miles & Neil, 2013), the retrospective design cannot guarantee the accuracy of the reported
557 self-talk and emotions. The players' memories could be distorted by various factors, such as
558 the outcome of the match, or the mood of the players during their interview. However, given
559 their subjective nature, it is important to recognize that all self-report measures have
560 limitations (de Guerrero, 2005). In addition, the mean score of the players' recall of their self-
561 talk (5.31 on a scale of 1 to 7) is in line with a recent study showing a strong correlation
562 between retrospective and concurrent self-talk measures (De Muynck et al., 2020), thus
563 supporting the integrity of retrospective methods. The fact that the data are in agreement with
564 the theoretical considerations (Latinjak et al., 2014; Van Raalte et al., 2016) and with previous
565 studies (Latinjak et al., 2017) further strengthens our confidence in the choice of method.
566 Finally, it is important to note that various studies have shown that the categorization of self-

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567 talk statements by researchers differs from that of the participants themselves (Latinjak et al.,
568 2017; Van Raalte et al., , 2014). Although, given the interpretative element of self-talk
569 (Latinjak, Hatzigeorgiadis, et al., 2019), the involvement of the participants in the
570 categorization process is important, it can be argued that the categories created by researchers
571 may have greater theoretical value (Latinjak, Hardy, et al., 2019). This point is important to
572 bear in mind because the purpose of the current study was primarily to test concrete
573 hypotheses derived from theory-driven self-talk approaches (Latinjak et al., 2014; Van Raalte
574 et al., 2016).

575 **Conclusion**

576 We are confident that this study is a significant contribution to the rapidly developing
577 self-talk literature. Particularly, the results underline the validity of dual-process self-talk
578 theories that recently have been introduced to the sport psychology literature (Latinjak et al.,
579 2014; Van Raalte et al., 2016). The results support the idea that, on the one hand, spontaneous
580 self-talk is inherently linked with emotions, and, on the other hand, that a main function of
581 goal-directed self-talk is emotion regulation (Latinjak, Hatzigeorgiadis, et al., 2019). From an
582 applied perspective, those players who struggle with their emotions in sport competitions
583 could benefit from the use of proactive or reactive goal-oriented self-talk with the aim of
584 emotion regulation.

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