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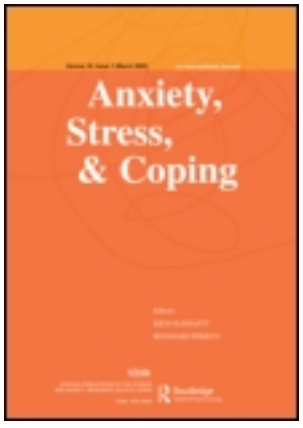

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Choking under pressure in sport has been explained by either explicit attention to skill execution (self-focus theories), or attention to performance worries (distraction theories). The aim of the present study was to find out which focus of attention occurs most often when expert athletes perform under pressure. Two retrospective methods were employed, namely, verbal reports and concept mapping. In the verbal reports, 70 expert athletes indicated their main focus of attention when performing under high pressure in competition. For concept mapping seven expert athletes generated statements about their focus of attention in such high-pressure situations. These statements were clustered and rated on how often they occurred and how important they were for choking. Both methods revealed that under pressure attention of expert athletes was often focused on worries and hardly ever on movement execution. Furthermore, the athletes reported that they focused attention on external factors and that they reverted to positive monitoring in an attempt to maintain performance. These results are more in line with distraction theories than self-focus theories, suggesting that attention to performance worries rather than to skill execution generally explains choking.

Keywords: anxiety; attention; concept mapping; choking under pressure; verbal reports

Choking under pressure is an interesting phenomenon in sports in which athletes perform much worse than expected, precisely when their best performance is required. A well-known example of choking under pressure is missing a decisive penalty in soccer. Because missing the penalty may have great consequences (e.g., psychological, social, and financial), the amount of pressure on a penalty taker is at a peak (Gerrard, 2007; Jordet, Elfering-Gemser, Lemmink, & Visser, 2006). This pressure increases the chances that the player will miss the penalty. Recently, Hill, Hanton, Fleming, and Matthews (2009) provided a contemporary definition of choking on the basis of the opinion of expert applied sport psychologists: "Choking in sport is a process whereby the individual perceives that their resources are insufficient to meet the demands of the situation, and concludes with a significant drop in performance – a choke" (p. 206; cf. Beilock & Gray, 2007; Gucciardi, Longbottom, Jackson, & Dimmock, 2010; Hill, Hanton, Matthews, & Fleming,

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2010). To be able to prevent choking, it is important to understand the mechanisms underlying this phenomenon.

There is converging evidence that pressure-induced anxiety causes shifts in attention that lead to decrements in performance (e.g., Behan & Wilson, 2008; Gucciardi et al., 2010; Murray & Janelle, 2003; Nieuwenhuys, Pijpers, Oudejans, & Bakker, 2008; Pijpers, Oudejans, Bakker, & Beek, 2006; Vickers & Williams, 2007). With respect to perceptual-motor tasks, self-focus theories claim that with increased anxiety there are shifts in attention to internal matters. These shifts either lead to explicit attention to the sequential steps of how the skill should be executed (explicit monitoring hypothesis; Beilock & Carr, 2001; Jackson, Ashford, & Norsworthy, 2006), or perhaps even to conscious control of the sequential steps of how the skill should be executed (conscious processing hypothesis; Masters, 1992). In experts such explicit conscious attention to, or even control of, subsequent steps of a skill may interfere with normal task execution hereby affecting performance (for more detailed discussions of the precise mechanisms see Beilock & Carr, 2001; Masters, 1992; Mesagno, Marchant, & Morris, 2008, 2009; Wilson, 2008; Wilson, Chattington, Marple-Horvat, & Smith, 2007; for a more extensive discussion of the difference between the two hypotheses see Jackson et al., 2006).

To date it has repeatedly been shown that adopting such a skill-focus of attention[1] impairs expert performance (e.g., Baumeister, 1984; Beilock & Carr, 2001; Gray, 2004; Gucciardi & Dimmock, 2008; Jackson et al., 2006; Liao & Masters, 2002; Mullen & Hardy, 2000; Mullen, Hardy, & Tattersall, 2005; Wilson et al., 2007). Therefore, Beilock and Gray (2007) concluded that there is compelling evidence that in the perceptual-motor domain choking is caused by explicit monitoring or conscious control of the execution of the skill. Nonetheless, in the studies in question, attentional focus was always experimentally manipulated (see also Hill et al., 2010). Participants were instructed, either directly or indirectly, to focus on skill execution while performing the task, making it impossible to draw definite conclusions about the mechanisms responsible for choking in a natural setting. Thus, however convincing the evidence for the negative effects of skill-focus may be, the evidence for self-focus theories of choking remains indirect and hence inconclusive. So far it has not been demonstrated that skill-focused attention often occurs naturally when expert athletes perform under pressure.

An alternative to self-focus theories is provided by distraction theories, with processing efficiency theory (PET; Eysenck & Calvo, 1992) and attentional control theory (ACT; Eysenck, Derakshan, Santos, & Calvo, 2007) being the most encompassing and recent editions. According to PET, anxiety leads to a shift of attention to thoughts and worries about performance (e.g., about consequences of failure). These thoughts and worries draw attention away from primary task execution leading to hampered performance. Anecdotal evidence (e.g., Gerrard, 2007) and studies examining athletes' thoughts during competition (e.g., Hatzigeorgiadis, 2002; Hatzigeorgiadis & Biddle, 2000, 2001; Lane, Harwood, & Nevill, 2005; Wilson & Smith, 2007), seem to suggest that, rather than skill-focused attention, all kinds of distracting thoughts and worries naturally occur when athletes perform under pressure. However, only thoughts unrelated to task execution (e.g., performance worries and task-irrelevant thoughts) were included in the questionnaires employed, while task-related thoughts (e.g., skill-focused attention) were not examined. Moreover, most of these studies investigated athletes' thoughts in relation to competition in

general and not in relation to the specific moments at which pressure and anxiety are at a peak, and choking is imminent. Thus, despite clear suggestions for distraction as a possible explanation for choking, from these studies it cannot be ruled out that under pressure skill-focused attention also occurs naturally and frequently in expert athletes.

Several other studies also remained inconclusive regarding the occurrence of internal distraction or skill-focused attention under pressure (cf. Edwards, Kingston, Hardy, & Gould, 2002; Hill et al., 2009; Smith et al., 2000, 2003). Mesagno et al. (2008, 2009) recently investigated choking in choking-susceptible participants in 10-pin bowling (2008) and basketball free-throw shooting (2009). Using a combination of experimental single-subject design and interviews they measured performance as well as cognitions under pressure. While Mesagno et al. (2008) found more indications of distracting thoughts and worries with three bowlers, Mesagno et al. (2009) found more indications of increased skill-focused attention under pressure with three basketball players. Findings were again obtained in an experimental setting as well as with only three expert bowlers and three basketball players, respectively. Gucciardi et al. (2010) investigated choking and accompanying thoughts and attention of expert golf players. The results provided most support for the occurrence of distracting thoughts and worries prior to and during choking. The combined results of these studies are clearly mixed and equivocal, making it difficult to draw definite conclusions about the attentional focus under pressure that occurs most often in a natural sport setting.

In the current study we examined to what degree skill-focused attention as well as distracting thoughts and worries spontaneously occur in high-pressure situations in expert athletes from a variety of sports. To that aim we explored thoughts and attention of expert athletes in such settings, without manipulating attention itself. Because it is difficult, if not impossible, to directly measure focus of attention in a competitive sports setting, two retrospective methods were employed (cf. Edwards et al., 2002; Gucciardi et al., 2010; Hill et al., 2009). The first method concerned a verbal report questionnaire similar to the Verbal Thought Questionnaire that was used to map the thoughts of individuals during a high-pressure test (Beilock, Kulp, Holt, & Carr, 2004). In the current study, the questionnaire specifically focused on thoughts and attention of expert athletes at those moments during competition when pressure is at a peak. The questionnaire was used to explore athletes' attention with a relatively large population.

The second method was concept mapping, a method specifically designed to develop a structured conceptualization of a topic or concept of interest. (Jackson & Trochim, 2002; Trochim, 1989a, 1989b, 1993). Concept maping "includes a sequence of structured group activities linked to a series of multivariate statistical analyses that process the group input and generate maps. Instead of representing the mental models of individual respondents, it depicts an aggregate representation of the text (across respondents) in the form of thematic clusters as generated by respondents" (Jackson & Trochim, 2002, p. 312). Concept mapping starts with a brainstorming session with experts who make an inventory of different views on a topic by generating as many statements as possible about that topic. By subsequently clustering and rating the statements a conceptual representation is made using multidimensional scaling and cluster analysis (Borg & Groenen, 2005; Hair, Black, Babin, Anderson, & Tatham, 2006; Jackson & Trochim, 2002; Romesburg, 2004).

Due to the criticality of the brainstorming session this method is not suitable for larger populations but restricted to a maximum of 10 participants.

Both methods seem viable methods to explore athletes' thoughts and attention without explicitly manipulating attention in the performance setting. In line with earlier findings we expected that distracting thoughts and worries reported by expert athletes would occur frequently. Given the inconclusiveness of the literature concerning the occurrence of skill-focused attention, we had no a priori expectations in this regard.

Verbal reports

Method

Participants

Verbal report questionnaires were sent out to approximately 350 athletes (precise number is not known as the verbal reports were also distributed via coaches). Since the purpose of this study was to explore attention of expert athletes under high pressure in general (e.g., not for one specific kind of sport), the athletes represented a large variety of sports. A total of 70 expert athletes (41 men, 29 women), representing 19 different kinds of sport, returned the completed verbal reports via email and provided written informed consent. Athletes represented nine individual and 10 team sports. About 25% of the athletes competed at the international level while 75% competed at the highest national level. The mean age of the participants was 23.4 years (SD = 3.5). The mean number of years of experience at the highest level of competition was 5.0 years (SD = 3.3). Prior to the study the protocol was approved by the institutional ethics committee.

Contents

The verbal report form started with several demographic questions followed by the following scenario:

> Think about the decisive moments in competition, the situations that are crucial for winning or losing, when the pressure is very high, and it is absolutely necessary to perform well, but when it is also very difficult to maintain your normal level of performance.

Subsequently, the following open-ended questions were asked:

> When the pressure you feel is at a peak, and you are failing, or you have the feeling you are about to fail, where is your attention focused and what do you think about during these decisive moments? What do you do to try to prevent failure?

The latter question was included to provide an additional trigger for athletes to report not only their initial but also subsequent thoughts and foci of attention. Particularly for skill-focused attention, it is possible that it does not occur as an initial reaction to the pressure but only as a secondary response in an attempt to cope with the situation. Athletes' implementation of coping strategies is generally thought to rely heavily on how they perceive and appraise their performance environments (e.g., Lazarus & Folkman, 1984; Nicholls & Polman, 2007; Nieuwenhuys, Hanin, & Bakker, 2008). It will only be after an athlete has perceived a certain situation as

taxing, or exceeding his or her resources, that he or she will try to do something about it.

Analyses

The answers to the open-ended questions were analyzed by two independent observers. Given that both questions served the same purpose, all participants provided only one verbal report in response to both questions. The statements that answered the aforementioned open-ended questions were selected by the observers from the verbal reports of the participants, resulting in two separate lists with statements (one from each observer). Inter-observer reliability was 85%. This means that there was 85% similarity between the numbers of statements that were selected by the two observers. The main difference between the lists was that one observer had scored statements the other observer had not, and vice versa. Therefore, all these statements were discussed and subsequently omitted or added to the list. Most of these statements were eventually added to the list. This resulted in a list of 431 statements, thus, about six on average per report, ranging between 2 and 21.

On the basis of several possibilities for attentional focus as reported in the literature (e.g., Gucciardi et al., 2010; Hatzigeorgiadis & Biddle, 2000; Jackson et al., 2006; Kirschenbaum, 1987; Mesagno et al., 2008, 2009; Wilson et al., 2007), each statement was categorized in one of the five following categories: *movement execution* (statements that concerned skill-focus); *worries* (statements that concerned distracting thoughts and worries); *external task-relevant* (e.g., statements concerning the ball or the opponent); *external task-irrelevant* (e.g., statements concerning the audience or cameras); and *positive monitoring*. "Positive monitoring" is a positive form of internal attention referring to positive self-talk statements as well as statements about the attentional focus that athletes adopt to enhance concentration and performance (e.g., I focus on my strengths, I make sure to look confident, I make sure that I work harder, I concentrate on my breathing). All 431 statements were categorized by the two observers independently. This resulted in a 94% inter-observer reliability. Finally, it was determined which percentage of statements was placed in each category.

Results

Table 1 shows the numbers and percentages of statements in each category. The most important result is the high percentage of statements concerning worries, 25.9%, in combination with the low percentage of statements concerning movement execution, 4.1%. Chi-square tests confirmed that athletes significantly more often had worries when performing under pressure than that their attention was on movement execution or on external matters, χ^2s(1) > 42.05, *p*s < .001. Furthermore, it seems that during performance under pressure athletes' attention was largely directed toward maintaining and regaining concentration to enhance performance, as indicated by the high percentage of statements regarding positive monitoring, 57.8%. Chi-square tests revealed that there were significantly more statements concerning positive monitoring than any other category, χ^2s(1) > 52.87, *p*s < .001.

Table 1. Number and percentage of statements in each category obtained from the verbal reports.

Category	Number of statements	Percentage
Movement execution	19	4.1
Worries	109	25.9
External task-relevant	32	7.2
External task-irrelevant	25	5.0
Positive monitoring	246	57.8
Total	431	100

Note: $N = 70$ athletes.

Concept mapping

Method

Participants

Seven expert athletes (two men and five women; different from the verbal report sample) participated. The athletes represented the following sports: volleyball; handball; cricket; slalom canoeing; and basketball. Their mean age was 23.1 years (SD = 2.9). All athletes were active at the highest national or international level of competition. The mean number of years of experience performing at the highest national level was 5.6 years (SD = 2.5). Prior to the study the protocol was approved by the institutional ethics committee.

Procedure

Concept mapping normally consists of six stages (Trochim, 1989a; cf. Jackson & Trochim, 2002). Given the purpose of this study, the final stage (i.e., determining how the results could be used in real-life) was not executed. In what follows each stage will be briefly described.

1. Preparation. In this phase several expert athletes were approached with the question whether they would be willing and able to participate in this study. Eventually seven athletes agreed to participate.

2. Generation of statements. After a brief introduction and an explanation of the procedure, participants completed a demographic questionnaire and provided written informed consent. The brainstorming session started with an explanation of some ground rules. Participants were asked to generate as many detailed statements as possible. They were allowed to engage in conversation with each other, but there could be no criticism or discussion regarding the legitimacy of statements. Furthermore, statements had to be formulated in such a way that all participants could understand them. Participants were encouraged to ask for clarification of unfamiliar terms.

After explaining the rules, the same scenario as in the verbal reports was presented and the same questions were asked (in brief, where are your thoughts and attention when performing under pressure? what do you do to prevent choking?). Then, the actual brainstorming began. Each generated statement was immediately written down and projected on a screen so that participants knew which statements

had already been made. After 90 minutes, when the generation of statements seemed to come to a halt, a total of 54 statements were generated, which resulted in the *Statement List* (see Table 2). What followed was a 30 minute break during which each statement was printed on a numbered card for each participant. This resulted in seven sets of 54 numbered cards.

3. Structuring of statements. Using a set of 54 cards, each participant grouped the statements in clusters in a way that made sense to them and adhering to the following rules: each statement should only be placed in one cluster; statements should not all be put into one single cluster; and clusters should not contain only one statement. Next each participant gave names to their own generated clusters. After clustering, participants were required to rate each statement two times, first, according to how often in general each statement occurred while performing under high pressure, and second, according to how important each statement was for them regarding actual choking. A statement rated as very important for choking implied that with the attentional focus or thoughts in question, choking would be likely to occur. Ratings were given on 5-point Likert scales ranging from 1 (=*never*) to 5 (=*always*), and 1 (=*very unimportant*) to 5 (=*very important*), respectively.

4. Statistical analysis and computation of maps. Statements were analyzed using multidimensional scaling (Borg & Groenen, 2005; Davison, 1983) and cluster analysis (Hair et al., 2006; Romesburg, 2004) in SPSS, following the suggestions by Trochim (1989a). The purpose of multidimensional scaling is to provide a visual representation of the pattern of proximities (i.e., similarities of distances) among a set of objects, in this case the statements by the athletes. With multidimensional scaling, each statement was assigned a set of *x–y* coordinates (called Dimension 1 and Dimension 2) based on their relative proximities from each other, that is, based on how often statements were clustered. The coordinates of each statement then served as input for the cluster analysis which grouped the statements into different clusters based on these coordinates. Cluster analysis refers to a variety of mathematical methods that can be used to find out which objects in a set are similar (Hair et al., 2006; Romesburg, 2004). Next, the ratings given to the statements by the participants were averaged per statement. These statement averages were averaged for each cluster. The end result is the *Cluster Rating Map* as shown in Figure 1.

5. Interpretation of maps. Finally, cluster names were determined by the researchers on the basis of content of the statements and the cluster names given by the participants. Then the results were interpreted and conclusions were drawn by the researchers.

Results

During the brainstorming session 54 statements were generated as shown in the *Statement List* (see Table 2). Because none of the participants made more than 10 clusters, only cluster solutions containing 10 or fewer clusters were further examined. Each of these solutions was analyzed starting with the solution with 10 clusters. There is no absolute criterion to decide which number of clusters is the best solution for a given data set (Trochim, 1989a). For the current data set a solution with six clusters seemed best. For this solution it was possible to find cluster names that

Table 2. List of statements including frequency and importance ratings grouped in clusters.

Nr.	Cluster and statements		Frequency	Importance
	Worries: negative thoughts (Cluster 1)			
3	I think: "This is not going well"		1.86	4.00
4	I think: "Everybody hates me"		1.29	3.00
5	I think: "I want to go home as quickly as possible"		1.43	2.43
12	I think: "Someone else will do it"		2.00	2.67
18	I think: "I should not…"		3.00	3.86
22	I think: "I can no longer win anyway"		2.14	3.43
25	I notice that I have tunnel vision		2.67	2.83
28	I think: "This one is not going in either"		2.40	4.60
30	I think: "I have to score this one now"		3.00	3.40
46	I think: "This is my bad hand/arm"		1.20	3.00
50	I think: "What am I doing here?"		1.43	3.43
51	I think: "I have no experience, yet I have to prove myself"		2.17	4.17
53	I think: "It is going bad, we really have to do better now"		2.33	1.83
		Mean	2.07	3.28
	Worries: uncertainty and doubts (Cluster 2)			
6	I think about the last time under pressure		3.00	3.29
16	I think: "How is it possible that I made a mistake?"		2.29	4.43
19	I notice that I have doubts about my decisions		2.14	4.00
24	I think: "Do I actually dare to do this?"		1.86	3.86
27	I think: "I have to shoot higher"		3.20	3.00
31	I think about the consequences of my action		2.43	3.57
35	I think about earlier misses while the feeling was good		2.57	4.43
39	I notice that I focus on the next action too early		2.43	3.43
52	I notice that I doubt a decision that I have to make		3.00	3.86
		Mean	2.55	3.76
	External factors (Cluster 3)			
7	I notice/focus on the audience		1.57	2.14
8	I notice/focus on the presence of television		1.28	1.71
9	I notice/focus on the referee		2.28	1.71
10	I notice/focus on the opponent		2.43	2.71
11	I notice/focus on my teammates		2.67	3.33
20	I notice/focus on the goalkeeper		2.67	3.00
23	I notice/focus on the water		2.33	2.50
36	I notice/focus on the ball		2.50	1.83
37	I notice/focus on the goal/the basket		2.75	1.50
47	I notice/focus on the time		2.20	2.60
49	I notice/focus on the score		2.83	3.50
54	I notice/focus on the end result		2.71	3.29
		Mean	2.35	2.49
	Positive monitoring: positive thoughts (Cluster 4)			
13	I think: "It will be fine"		3.14	1.14
26	I think: "I am the one who can do this best"		3.00	1.50
29	I think: "I can do this"		3.57	1.29
32	I think: "Come one, give me the ball"		3.33	1.17

Table 2 (*Continued*)

Nr.	Cluster and statements		Frequency	Importance
42	I think: "Keep it simple"		2.57	1.86
45	I make sure that I stay calm		3.00	1.57
48	I think: "We will win this one"		2.71	2.00
		Mean	3.05	1.50
	Positive monitoring: focusing points (Cluster 5)			
15	I focus on what I should do		3.57	1.71
17	I make sure to go back to basics		3.14	1.86
21	I visualize the next action(s)		2.86	1.86
33	I make sure that I work harder		3.86	1.71
34	I focus on defense		3.20	1.40
38	I focus on the position of my direct opponent		2.80	1.80
40	I make sure that I guide my teammates		2.67	1.50
41	I focus on my strengths		3.14	1.58
43	I focus on the strengths of the team		4.00	1.33
44	I focus on what we agreed on		3.29	1.71
		Mean	3.25	1.65
	Other (Cluster 6)			
1	I focus on my technique		3.00	3.57
2	I focus on my heart rate		2.43	2.29
14	I focus on intimidation of the opponent		2.14	2.29
		Mean	2.52	2.72

Note: Frequency concerns how often a statement occurred under high pressure, 1 = *never*, 5 = *always*. Importance concerns how important a statement was for choking, 1 = *very unimportant*, 5 = *very important*. $N = 7$ athletes.

adequately covered the statements in each cluster and that were consistent with the proposals of the athletes. Moreover, the stress value found for the solution with six clusters was sufficiently low, namely, .16 (Davison, 1983). The stress value "reflects the goodness of fit of the map to the original dissimilarity matrix that served as input. A lower stress value implies a better fit" (Trochim, 1993). The value of .16 falls well within reasonable standards of reliability (Trochim, 1993) as well as within the range of .10–.35 that is considered appropriate for map interpretation (Poole, Duvall, & Wofford, 2006). In the solution with five clusters, statements with rather different contents appeared in the same cluster and it was no longer possible to give appropriate names to the clusters. Therefore, it was decided to use the cluster solution with six clusters for further analysis.

For the solution with six clusters, Figure 1 shows the *Cluster Rating Map*, that is, the statements as they were placed by multidimensional scaling, how the statements were grouped by the cluster analysis, and the average cluster ratings on frequency and importance. Statements that are more similar with respect to their content are closer to each other on the map. For example, the statements "I pay attention to the spectators" (7) and "I pay attention to the presence of television" (8) (see Table 2) show overlap on the map, which means that they are highly similar. The following clusters were distinguished: "Worries: Negative thoughts" (Cluster 1), "Worries: Uncertainty and doubts" (Cluster 2), "External factors" (Cluster 3), "Positive Monitoring: Positive thoughts" (Cluster 4), "Positive Monitoring: Focusing points" (Cluster 5), and "Other" (Cluster 6).

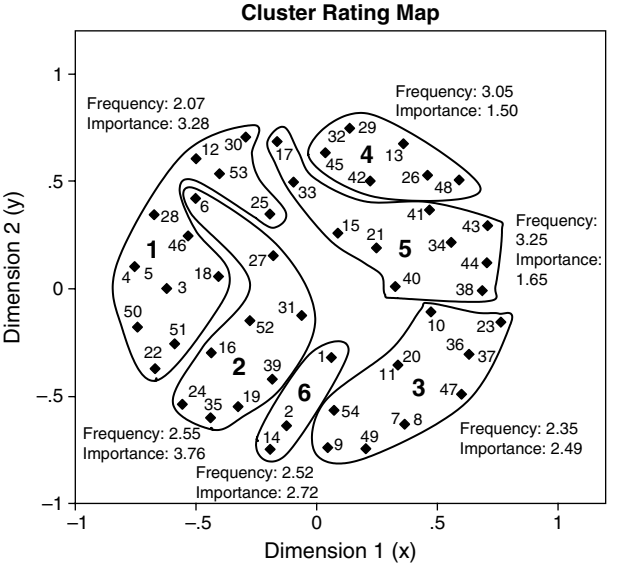

Figure 1. Cluster Rating Map showing the six clusters: (1) Worries: Negative thoughts; (2) Worries: Uncertainty and doubts; (3) External factors; (4) Positive monitoring: Positive thoughts; (5) Positive monitoring: Focusing points; (6) Other. Multidimensional scaling yielded *x*- and *y*-coordinates (Dimension 1 and 2) for each statement based on how often statements were clustered. The numbers next to the points on the map refer to the statements in Table 2; due to overlap some points represent two statements. Mean frequency and importance ratings are given for each cluster. Frequency concerns how often a statement occurred under high pressure, 1 = *never*, 5 = *always*. Importance concerns how important a statement was for choking, 1 = *very unimportant*, 5 = *very important*.

As can be seen in Figure 1, Clusters 1 and 2 (Worries) have the highest importance ratings (3.28 and 3.76, respectively), combined with relatively moderate frequency ratings (2.07 and 2.55). Clusters 4 and 5 (Positive Monitoring) have the highest frequency ratings (3.05 and 3.25) combined with the lowest importance ratings (1.50 and 1.65). This means that *worries* were considered to occur with moderate frequency when athletes have to perform under pressure. Furthermore, worries were considered to be quite important for the occurrence of choking. Positive monitoring occurred frequently but was not seen as a cause of choking. Cluster 6 contained three unrelated statements, one of which concerned movement execution (“technique”).

Discussion

The purpose of the present study was to explore the thoughts and focus of attention of expert athletes from a variety of sports when performing under pressure, without manipulating attention. We were specifically interested to find out to what degree distracting thoughts and worries, or skill-focused attention would generally occur. The verbal reports revealed that relatively few statements, as generated by 70 expert athletes, concerned movement execution (i.e., skill-focused attention) in its broadest sense (only 4.1% of the 431 statements). In contrast, 25.9% of the statements

concerned worries. As 62 of the 70 athletes performed a sport that at least contained some kind of accurate aiming tasks (kicking, throwing, or hitting), the limited amount of skill-focused attention that was reported cannot be attributed to a lack of high-precision tasks in the study population.

The concept mapping resulted in six clusters. Strikingly, these clusters captured the same categories as those used for the verbal reports (worries, positive monitoring, external factors). Only one of the 54 statements concerned movement execution. The frequency rating for this statement was moderate and if it occurred it was seen as important for choking (Table 2). This statement was the first statement that was mentioned in the brainstorming session. Nevertheless, it did not lead to any further association about movement execution, even though one of the strengths of a brainstorming session is that one statement may lead to other related statements. Altogether, the findings suggest that next to distracting worries and positive monitoring, competition pressure does not often induce skill-focused attention. Distracting thoughts and worries occur much more often and these are reported to be important for choking. These findings are consistent with recent findings in the literature, particularly those by Gucciardi et al. (2010).

A possible limitation of the current study concerns the use of retrospective methods for exploring attention. Whereas more and more mobile and flexible methods are available to measure visual attention (i.e., gaze behavior; e.g., Behan & Wilson, 2008; Nieuwenhuys et al., 2008; Wilson, Vine, & Wood, 2009; Wilson, Wood, & Vine, 2009), it is impossible to directly measure the internal focus of attention of athletes. Moreover, it is difficult to measure attention close to or during the event of interest, that is, actual competition. Therefore, most research is done in experimental settings with attentional manipulations and artificially induced anxiety. So far, this has only resulted in indirect evidence about possible changes in internal attention following increases in anxiety. Because our purpose was to avoid any attentional manipulation, retrospective questionnaires were used (cf. Edwards et al., 2002). A drawback of this method revolves around the question to what extent people are able to accurately recall and report thoughts and attentional focus. Note however, that in this study, participants had to recall often recurring, well-known, and familiar situations. This increases the validity and reliability of the results (cf. Beilock & Carr, 2001; Tenenbaum, Lloyd, Pretty, & Hanin, 2002). Furthermore, that both methods independently led to similar statements, both with regard to content (categories of attentional focus) and quantity (many worries and limited reports of skill-focused attention) inspires confidence in the present results.

The current study does not allow definitive conclusions about the causal mechanisms underlying choking; especially as the verbal report data did not contain information about how often and when choking occurred. The results reflect the degree to which different foci of attention seem to occur in general when expert athletes perform under high competitive pressure. The results suggest that the manipulation of skill-focused attention within experimental settings (as adopted by the majority of choking studies), does not appear to replicate the attentional disruption that occurs under "real life" pressure conditions. Future research is necessary to study the attentional processes under pressure with a more explicit link to actual choking within natural settings (cf. Gucciardi et al., 2010).

Speculating about the causal mechanisms of choking, it seems that the results provide little support for self-focus theories. These theories claim that choking is

caused by explicit attention to, and perhaps even control of, subsequent steps of task execution, which disrupts normal task execution and harms performance. The current results show that skill-focused attention rarely occurs naturally when athletes perform under pressure (cf., Gucciardi et al., 2010; Mesagno et al., 2008, 2009).

Overall, the current results are in line with distraction theories of choking, most notably PET (Eysenck & Calvo, 1992). PET provides a comprehensive account of the mechanisms behind the effects of anxiety on performance and has recently been updated into ACT (Eysenck et al., 2007). According to PET, anxiety leads to a shift of attention to worries that draw attention away from primary task execution leading to hampered performance. Going beyond other distraction models, PET and ACT provide an explanation for why anxiety does not necessarily have to lead to a decrement in performance. According to Eysenck and colleagues (Eysenck & Calvo, 1992; Eysenck et al., 2007), negative effects of anxiety may be compensated for by self-regulatory processes, involving increased motivation, on-task effort, and additional activities to improve or maintain performance. The specific combination of worries and positive monitoring found in the current study is consistent with the mechanisms proposed by PET and ACT (see also Wilson, 2008). The high frequency of positive monitoring indicates that under high pressure athletes invest extra effort in an attempt to counter the negative effects of anxiety. The findings are also in line with several recent studies on choking in sports that have found support for PET and ACT (e.g., Behan & Wilson, 2008; Edwards et al., 2002; Wilson et al., 2007; Wilson, Vine, et al., 2009; Wilson, Wood, et al., 2009).

It is important that solutions to prevent choking are geared toward the negative effects of distracting thoughts and worries. Oudejans and Pijpers (2009, 2010) showed that training with anxiety holds promise in that regard (cf. Oudejans, 2008). Training with anxiety led to acclimatization to the processes involved in performing under pressure. In line with expectations on the basis of ACT, it seemed that, after training with anxiety, additionally invested mental effort (e.g., positive monitoring) was more effective in countering the negative effects of anxiety. Furthermore, psychological skills training (e.g., relaxation, imagery, and centering) can help athletes to learn to control their anxiety, thoughts, and focus of attention. Most important, the current study shows that, generally, pressure induces more distracting thoughts and worries than skill-focused attention, making clear that preventive measures for choking should be directed at reducing worries and enforcing positive monitoring.

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Note

1. Although in the recent choking literature the umbrella term used is "self-focus" theories (Gucciardi & Dimmock, 2008; Jackson et al., 2006; Mesagno et al., 2008, 2009; Wilson, 2008), it is an attentional focus on the *skill* that is assumed to occur under pressure and to be the starting point of choking, whether the eventual cause is just the attention to skill execution (explicit monitoring) or the conscious control of the skill (cf. Jackson et al., 2006). Therefore, we use the term skill-focused attention or skill-focus (cf. Beilock & Carr,

2001) throughout this paper to refer to the type of attention that is assumed to be essential for choking according to self-focus theories.

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