

INTENSITY AND DIRECTION OF ANXIETY AND SELF-CONFIDENCE AMONG ELITE SOUTH AFRICAN CRAWL STROKE SWIMMERS AND ITS RELATIONSHIP TO PERFORMANCE

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SUMMARY

The purpose of this study was to determine the intensity and direction (i.e., perceived effect) of anxiety and self-confidence among elite South African crawl stroke swimmers as well as its relationship to the performance of this population. Fifteen men (19.0 ± 3.36 years) and 12 women (17.7 ± 2.45 years) finalists of at least one crawl stroke item during the South African Swimming Championships completed the Competitive State Anxiety Questionnaire Inventory-2 (CSAI-2) of Martens et al (1990) with an added Facilitative/Debitative scale (Jones and Swain, 1992). Low to moderate relationships existed between the three psychological constructs levels and swimming performances. Significant ($p < 0.05$) correlations were observed among the women swimmers for the perceived effect of somatic state anxiety and cognitive state anxiety with performance respectively. Standard multiple regression analyses showed that the performances of women swimmers were more related to their perception of cognitive state anxiety towards performance (-39.85%), while that of men swimmers were more related to their perception of state self-confidence (-9.19%). It should, however, be noted that variables other than the psychological variables included in this study, were also highly related to swimming performances, especially in the case of the men.

INTRODUCTION

Optimal swimming performance is the result of various factors, such as morphological, physiological, biomechanical, tactical and psychological factors (Smith et al, 2002), of which the sport psychological factors and skills are considered to be of the most important performance determinants (Grundlingh and Van Staden, 1998). Smith et al (2002) further indicated that sport psychological constructs such as anxiety and self-confidence could affect swimming performance positively or negatively. Numerous studies have focused on the intensity levels of anxiety (somatic and cognitive) and self-

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confidence that swimmers experience and the effect thereof on swimming performance (Barnes et al, 1986; Hanton and Jones, 1995; Grundlingh and Van Staden, 1998; Hanton and Connaughton, 2002; Smith et al, 2002). Unfortunately, no studies could be found that addressed the relationship between the named sport psychological constructs and swimming performance among South African swimmers. It is in light of this shortcoming that a brief literature overview of the last-mentioned theme follows.

Pertaining to the above-mentioned skills, Psychountaki and Zervas (2000) distinguished between two types of anxiety, namely trait and state anxiety. These researchers defined trait anxiety as the relatively stable tendency of individuals to experience worry, while state anxiety refers to the situational tendency of individuals to become worried in sporting conditions. State anxiety can further be divided into somatic and cognitive anxiety. Barnes et al (1986) described somatic anxiety as the psychological component of anxiety that can be identified by symptoms such as rapid heart rate, clammy hands, "butterflies" in the stomach, jittery legs and nausea, all due to nervousness and tension. According to Hanton and Jones (1995), cognitive anxiety relates to negative expectations, negative self-evaluation, concerns about oneself, the competition, losing or not reaching specific goals.

Another sport psychological skill within the context of cognitive anxiety is self-confidence. In this regard Martens et al (as quoted by Barnes et al, 1986) indicated that self-confidence could be viewed as the absence of cognitive anxiety. Barnes et al (1986) subsequently reported a moderate correlation ($r=-0.544$) between cognitive anxiety and self-confidence. Martens (1987) defined self-confidence as an athlete's realistic expectation about achieving success, while Barnes et al (1986) described it as the strength of an athlete's conviction that a specific goal can be reached successfully.

It is in the light of these definitions that research findings concerning the relationship between the last mentioned sport psychological constructs (somatic anxiety, cognitive anxiety and self confidence) and sport performance are given. As far as somatic anxiety is concerned, Martens et al (as quoted by Hanton and Connaughton, 2002) reported an inverted-U correlation between somatic anxiety levels and sporting performance. Barnes et al (1986), however, stated that the observed correlation between somatic anxiety and swimming performance is

normally very small ($r=-0.166$). Moreover, the same authors also demonstrated that small correlations exist between the cognitive anxiety levels and swimming performance ($r=-0.391$), as well as between self-confidence levels and swimming performance ($r=0.191$).

Despite the rather small correlations that exist between the three sport psychological constructs and swimming performance, Jones and Swain (1992) as well as Hanton and Connaughton (2002) found that elite athletes have significantly greater facilitative perceptions regarding the effect of their cognitive and somatic anxiety levels towards performance than non-elite athletes. Furthermore, Wiggins and Brustad (1996) showed that swimmers with lower scores on cognitive and somatic anxiety and higher scores on self-confidence perceived their anxiety as more facilitative to performance.

Collectively, the above-mentioned findings indicate that the intensity (levels) of somatic state anxiety, cognitive state anxiety and state self-confidence and the perceived effect of these constructs towards swimming performance (direction) have a direct effect on the ultimate outcome of each swimming race.

It is in the light of this literature background and contradictory research findings that a study was undertaken to determine the intensity and direction of state anxiety and state self-confidence among elite South African crawl stroke swimmers as well as its relationship to the performance of this population. The results will enable Sport Scientists and Sport Psychologists to gain a clearer understanding of the important role that certain sport psychological constructs play in the performance outcomes of South African swimmers.

METHOD

Sample Population:

Fifteen men (19.0 ± 3.36 years) and 12 women swimmers (17.7 ± 2.45 years) who reached one or more of the crawl stroke event finals (ten top places) at the Telkom South African National Swimming Championships, were included in the study. The men and women swimmers had been competing in swimming for 9.0 ± 4.82 and 6.5 ± 3.02 years respectively. All subjects were informed about the measurement procedures, possible risks and benefits of the research project and all of them or their parents/guardians signed informed

consent forms before participating in this study. The swimmers' demographic and personal information (gender, race and age) was collected by means of a demographic and general information questionnaire. The swimmers' injury incidence, competing levels as well as performances of the last few years were also determined by means of this questionnaire.

Questionnaires:

State anxiety (cognitive and somatic) and state self-confidence were measured by means of the Competitive State Anxiety Inventory-2 (CSAI-2) (Martens et al, 1990). The CSAI-2 is a 27-item self-report questionnaire that measures the above-mentioned sport psychological constructs in competitive situations. Each of the 27 items is rated according to a 4-point Likert scale that ranges from 0 ("not at all") to 4 ("very much so"). After the completion of the normal CSAI-2, an added Facilitative/Debilitative scale of Jones and Swain (1992) were employed. The latter section was answered according to a 7-point Likert scale that ranged from 0 ("very debilitating") to 7 ("very facilitative"). The modified questionnaire measures swimmers' perceptions of each of the above-mentioned constructs' contribution to swimming performance.

The modified CSAI-2 is considered to be a reliable ($r=0.82-0.83$ for the somatic anxiety, $r=0.79-0.83$ for the cognitive anxiety and $r=0.87-0.90$ for the self-confidence scale) and valid instrument to determine the intensity (levels) of cognitive anxiety, somatic anxiety and state self-confidence, as well as the expectations of performance and the directionality of the latter constructs among athletes (Ostrow, 1996).

Statistical Procedures:

The Statistical Consultation Service of the North-West University determined the statistical methods and procedures for the analysis of the research data. The Statistica Data Processing package (StatSoft Inc., 2004) was used to process the data. Firstly, the descriptive statistics of each test variable were calculated. This was followed by an independent t-test that was used to determine the significance of differences with regard to the levels, expectations of performance and the directionality of cognitive state anxiety, somatic state anxiety and state self-confidence between the men and women swimmers. Thirdly, correlation coefficients were calculated for each of the modified CSAI-

TABLE 1: Intensity and the directionality of the cognitive state anxiety, somatic state anxiety and state self-confidence among the women crawl stroke swimmers.

Construct	Construct level (n = 12)				Perceived effect (n = 12)			
	M ± SD	Poor	Average	Good	M ± SD	Debilitative	Neutral	Facilitative
Somatic state anxiety	20.8 ± 5.72	9 - 14 16.6% (n = 2)	21 - 36 41.7% (n = 5)	15-20 41.7% (n = 5)	39.1 ± 9.97	9 - 27 -	28 - 44 75.0% (n = 9)	45 - 63 25.0% (n = 3)
Cognitive state anxiety	20.2 ± 3.58	21 - 36 50.0% (n = 6)	17 - 20 25.0% (n = 3)	9-16 25.0% (n = 3)	35.8 ± 8.74	9 - 27 8.3% (n = 1)	28 - 44 66.7% (n = 8)	45 - 63 25.0% (n = 3)
State self-confidence	25.8 ± 3.43	9 - 21 16.6% (n = 2)	22 - 28 58.4% (n = 7)	29-36 25.0% (n = 3)	48.0 ± 8.31	9 - 27 -	28 - 44 41.7% (n = 5)	45 - 63 58.3% (n = 7)

Note: M=Mean, SD=Standard deviation

2 constructs and the performances that the swimmers achieved in the different crawl stroke events. Lastly, a standard multiple regression analysis was used to determine the contribution of each of the sport psychological variables to the ranking that each of the swimmers achieved during their participation in the South African National Swimming Championships. Swimmers were ranked according to the best attained position and qualifying times for their respective crawl stroke events. The level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

The descriptive statistics of the intensity and the directionality of the cognitive state anxiety, somatic state anxiety and state self-confidence among the women and men swimmers respectively are presented in Tables 1 and 2.

From these results it is evident that the majority of the men and women swimmers were categorized with good somatic state anxiety, poor cognitive state anxiety and average state self-confidence levels. The perceived effect of the somatic state anxiety and cognitive state anxiety towards performance was predominantly categorized as neutral, while state self-confidence was perceived as being more facilitative to performance. Furthermore, the results showed that most of the swimmers obtained low scores with regard to the various sport psychological constructs.

The t-test results of the comparison between the women and men swimmers' psychological constructs revealed no significant differences. Even though the results show no statistically significant differences between the two groups, specific tendencies were clearly visible and will be discussed. The men achieved higher self-confidence levels (28.3 ± 3.56) than the women (25.8 ± 3.43). These results are consistent with that of Cox and Liu (1993), who found that men swimmers have higher state self-confidence levels than their women counterparts. According to Hanton and Jones (1995), the self-confidence levels of men swimmers originate from interpersonal comparisons and a will to win, while that of women swimmers originate from striving to reach personal goals and standards. These differences may account for the lower self-confidence levels that are observed among women swimmers when compared to men swimmers.

TABLE 2: Intensity and the directionality of the cognitive state anxiety, somatic state anxiety and state self-confidence among the men crawl stroke swimmers.

Construct	Construct level (n = 15)			Perceived effect (n = 14)				
	M ± SD	Poor	Average	Good	M ± SD	Debitative	Neutral	Facilitative
Somatic state anxiety	20.3 ± 4.11	9 - 13	20 - 36	14 - 19	37.4 ± 7.55	9 - 27	28 - 44	45 - 63
		-	40.0%	60.0%		14.3%	64.3%	21.4%
			(n = 6)	(n = 9)		(n = 2)	(n = 9)	(n = 3)
Cognitive state anxiety	19.5 ± 5.58	20 - 36	17 - 19	9 - 16	34.7 ± 8.56	9 - 27	28 - 44	45 - 63
		46.7%	20.0%	33.3%		21.4%	64.3%	14.3%
		(n = 7)	(n = 3)	(n = 5)		(n = 3)	(n = 9)	(n = 2)
State self-confidence	28.3 ± 3.56	9 - 23	24 - 29	30 - 36	51.3 ± 4.48	9 - 27	28 - 44	45 - 63
		6.7%	53.3%	40.0%		-	7.14%	92.9%
		(n = 1)	(n = 8)	(n = 6)			(n = 1)	(n = 13)

Note: M=Mean, SD=Standard deviation

TABLE 3: The correlation coefficients for each of the modified CSAI-2 constructs and the performances that the swimmers achieved in the different crawl stroke events.

Item	Population		Correlations with swimming performance					
			Somatic anxiety		Cognitive anxiety		Self-confidence	
	Gender	n	Level	Perceived effect	Level	Perceived effect	Level	Perceived effect
100m	Men	-	-	-	-	-	-	-
	Women	7	0.04	0.50	-0.55	0.67	-0.30	-0.32
200m	Men	10	0.11	0.12	0.20	-0.12	-0.30	-0.33
	Women	8	-0.56	0.81*	-0.54	0.67	0.34	0.43
400m	Men	7	-0.15	-0.08	-0.08	-0.40	-0.21	-0.37
	Women	8	-0.30	0.68	0.76	0.85*	0.29	0.56
800m	Men	8	0.24	-0.40	0.35	-0.46	-0.26	-0.01
	Women	5	0.50	0.10	-0.69	0.90*	-0.16	0.22
1500m	Men	7	0.19	0.01	0.15	-0.12	-0.12	0.88
	Women	4	0.41	0.14	-0.40	0.41	-0.85	-0.20

The correlation coefficients for each of the modified CSAI-2 constructs and the performances that the swimmers achieved in the different crawl stroke events are presented in Table 3.

The correlation results of the men swimmers showed non-significant and inconsistent values throughout with low correlations between a substantial number of variables and swimming performances. Moreover, in a number of instances the correlations were not in the expected direction. These results seem to indicate that the different CSAI-2 constructs have a small effect on the performances of men swimmers. Contributing factors thereto might be the relatively poor construct levels of the men swimmers in this study, the relatively small sample size (15) and the ongoing debate as to whether the modified CSAI-2 accurately measures the named sport psychological constructs (Craft et al, 2003).

Statistically significant correlations were found for the women swimmers, for both the perceived effect of their somatic state anxiety and 200m performance ($r=0.81$) and the perceived effect of cognitive state anxiety and 400m ($r=0.85$) as well as 800m ($r=0.90$) performances.

Correlations between the perceived effect of somatic state anxiety and swimming performances ranged from low to high ($r=0.10$ to $r=0.81$), depending on the distance of the crawl stroke event in question. The higher correlations were observed for the shorter crawl stroke events (200m and 400m) compared to the longer events (800m and 1500m), where very low correlations were found. These results are similar to those of Burton (1988) who found that short duration events demonstrate stronger relationships between somatic anxiety and performance than do long duration events.

Moderate negative correlations were observed for the relationship between cognitive state anxiety levels and the resulting performances in most of the crawl stroke events of the women swimmers. The negative correlations indicate that lower cognitive state anxiety levels are associated with better crawl stroke performances. Research concerning the anxiety-performance relationship has also indicated that cognitive anxiety is more consistently and strongly related to swimming performances than somatic anxiety (Burton, 1988). The same author also concluded that cognitive anxiety and performance among swimmers exhibit a negative linear relationship. An additional finding of the correlation results is that the perceived importance of cognitive state anxiety is more related to crawl stroke performances among women swimmers than any other tested sport psychological construct. This is emphasized by the fact that the correlation values between the performances in two of the crawl stroke events (400m and 800m) and the perceived effect of cognitive state anxiety are statistically significant ($p<0.05$).

For both the men and women swimmers small and inconsistent correlations were found between the somatic state anxiety levels, the state self-confidence levels and the perceived effect of state self-confidence on performance and the actual performance outcomes. The results of the state self-confidence levels and the perceived effect of these constructs towards performance are surprising in view of previous research findings that did not coincide with these results. Craft et al (2003) have for example concluded that self-confidence is a good predictor of swimming performance. The direction of the majority of the self-confidence-performance relationship results (negative) are also not supported in the literature. In this regard, Burton (1988) demonstrated that self-confidence and performance exhibit a positive linear relationship among swimmers. Fourteen years later, Hanton and

Connaughton (2002) also reported that increases in self-confidence were perceived to improve swimming performances while decreases were perceived to lower performances.

The descriptive statistics were among other things used to do standard multiple regression analyses. The results of the analyses are provided in Table 4.

The percentage contribution of the CSAI-2 constructs to the ranking of the crawl stroke swimmers, as was calculated by means of the squared semi-partial correlation, is graphically presented in Figure 1. According to these results the ranking that was achieved in any of the crawl stroke events is mostly influenced by a women swimmer's perceived effect of cognitive state anxiety (-39.85%).

FIGURE 1: Percentage contribution of the most important CSAI-2 constructs to the ranking of women and men crawl stroke swimmers.

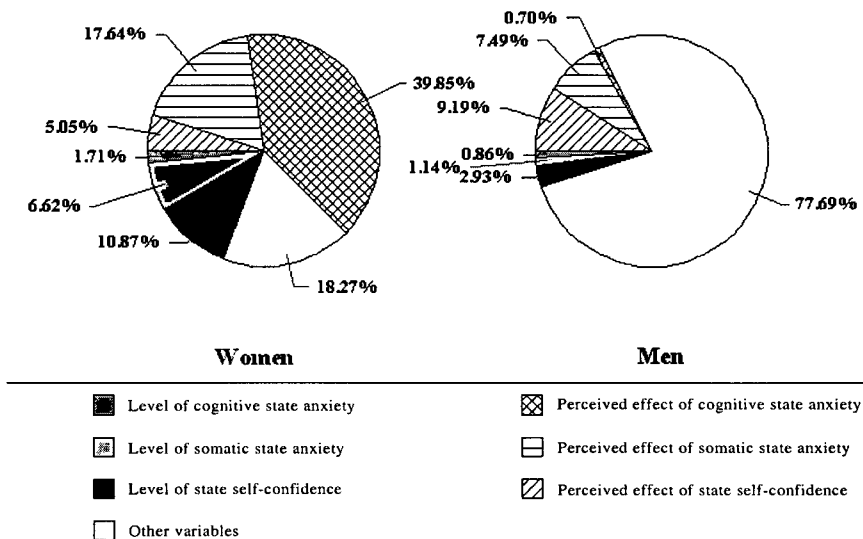


TABLE 4: Results of the standard multiple regression analyses to determine the sport psychological variables which contribute the most to the ranking of women and men crawl stroke swimmers.

Sport psychological variables	Beta in	Partial corr.	Semi-partial corr.	Tolerance	P-level
Women (n = 12)					
Level of somatic state anxiety	-0.2228	-0.2032	-0.1306	0.3435	0.6622
Perceived effect of somatic state anxiety	-1.2591	-0.7082	-0.6312	0.2514	0.0750
Level of cognitive state anxiety	0.5943	0.3783	0.2572	0.1873	0.4027
Perceived effect of somatic state anxiety	1.1346	0.5551	0.4200	0.1370	0.1959
Level of state self-confidence	0.5162	0.4640	0.3297	0.4078	0.2943
Perceived effect of state self-confidence	-0.3969	-0.3363	-0.2248	0.3206	0.4608
Men (n = 15)					
Level of somatic state anxiety	-0.1242	-0.0990	-0.0928	0.5580	0.7856
Perceived effect of somatic state anxiety	-0.2825	-0.0891	-0.0834	0.0872	0.8067
Level of cognitive state anxiety	0.1868	0.1137	0.1068	0.3267	0.7544
Perceived effect of cognitive state anxiety	0.9948	0.2816	0.2737	0.0757	0.4306
Level of state self-confidence	0.3218	0.1805	0.1712	0.2830	0.6177
Perceived effect of state self-confidence	-0.9265	-0.3092	-0.3032	0.1071	0.3847

Note: corr.=correlation coefficients

In contrast with the perception of women swimmers that cognitive state anxiety has a positive effect on swimming performance, the result indicates that the opposite is true. In other words women swimmers, who held the perception that their cognitive state anxiety levels would benefit their swimming performances, achieved the lowest rankings. The second, third, fourth and fifth most contributing sport psychological constructs are the perceived effect of somatic state anxiety (17.64%), the state self-confidence level (10.87%), somatic state anxiety level

(6.62%) and the perceived effect of state self-confidence (-5.05%) respectively. The remaining sport psychological constructs each accounted for less than 2% of the performance outcomes. Overall the women's results also show that the sport psychological constructs of the CSAI-2 have a bigger performance prediction power (81.73%) compared to that of other variables (18.27%).

In contrast to the above-mentioned results, the results of the men's multiple regression analysis showed that factors other than the variables in this study have a more substantial (77.69%) influence on their swimming performance outcomes. From the figure it is also clear that the perceived effect of state self-confidence contributes (-9.19%) the most of all the sport psychological constructs to the crawl stroke performances of men swimmers. It is, however, difficult to explain why an inversed relationship exists between the perceived effect of state self-confidence and swimming performance. A plausible explanation may be that men had unrealistically high perceptions of the role that self-confidence plays in the achievement of swimming performances. The sport psychological constructs which had the second and third biggest influence on the performances of men swimmers were the perceived effect of somatic state anxiety (7.49%) and the state self-confidence levels (2.93%). The remaining three sport psychological constructs each accounted for less than 2% of the performance outcomes.

Collectively these results indicate that the perceived effect (direction dimension) of the studied sport psychological constructs is more related to crawl stroke swimming performances than the intensity dimension of these constructs. This finding is in agreement with that of Burton (1998) who came to the same conclusion regarding the importance of psychological constructs' direction dimensions towards sport performance outcomes.

CONCLUSIONS AND RECOMMENDATIONS

In summary, the present study does add additional support to the work of others who have demonstrated some relationship between sport psychological constructs and sport performances. From the results and discussion it is clear that the majority of the South African crawl stroke swimmers obtained poor to average scores for the intensity of somatic state and cognitive state anxiety as well as state self-confidence.

For the perceived effect of the last-mentioned constructs towards swimming performance, two out of the three constructs produced a higher percentage of neutral answers. State self-confidence was the only sport psychological construct that the majority of swimmers perceived to be facilitative towards swimming performances.

In examining the relationship between the intensity of the last-mentioned constructs and swimming performances, small to moderate correlation coefficients were observed. Small to high and even significant correlations were shown for the relationship between the direction dimension of the sport psychological constructs and swimming performances. The significant correlations for the relationships between the sport psychological constructs and swimming performance were, however, only limited to the women swimmers and the 200m, 400m and 800m crawl stroke events, respectively.

A further analysis of results, in which a standard multiple regression analysis was used, demonstrated that the performances of women swimmers were more related to their perception of cognitive state anxiety (-39.85%), the perceived effect of somatic state anxiety (17.64%), the intensity of state self-confidence (10.87%) and somatic state anxiety (6.62%), the perceived effect of state self-confidence (-5.05%), than any other variable. Collectively the women's results also showed that the sport psychological constructs had a bigger performance prediction power (81.73%) compared to that of other variables (18.27%). The results of the men's data do, however, suggest that factors other than the sport psychological constructs in this study contribute more (77.69%) to the variance in top South African men crawl stroke swimmers' rankings. Nevertheless, it was found that the perceived effect of state self-confidence (-9.19%), the perceived effect of somatic state anxiety (7.49%) and the intensity of state self-confidence levels (2.93%) of men contribute the most of all the tested sport psychological constructs to crawl stroke swimming performances.

The relationship between psychological constructs and swimming performances are, therefore, dependent on the gender of the subjects, the distance of the crawl stroke event of participation and the dimensions of the psychological constructs that are tested. The study, therefore, emphasizes the importance of implementing intervention programs aimed at lowering anxiety intensity and enhancing self-confidence among crawl stroke swimmers in South Africa. It is thought that this would in turn increase

perceptions that anxiety and self-confidence is more facilitating and less debilitating to swimming performance (Burton, 1998). Furthermore, Wiggins and Brustad (1996) found that the swimmers who have lower scores on cognitive and somatic anxiety and higher scores on self-confidence perceive their anxiety as more facilitative towards performance.

Several shortcomings of this study should, however, be considered when interpreting the data. Firstly, further research with multiple swimmers in competitive conditions is needed prior to generalization of these findings. A bigger sample size would, therefore, be advisable. A great need exists for multi-factorial research that focuses on all the relevant, potential performance determinants of swimmers who participate in different swimming events. Further studies should, therefore, attempt to fulfill this need.

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