STRESS IN HIGH PERFORMANCE ATHLETES

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Abstract
The present article summarizes the results of an empirical study dealing with the effects of the type of sports and gender on stress level in athletes with average and high performance. The sample included two hundred forty participants, and the perceived level of stress has been measured with an instrument consisting in three factors: physical and psychological burnout, solicitation during athletic competitions, and activism. Specific validity and reliability issues regarding the research instrument are also reported within the present study. Results of statistical analysis for the effect of gender, sports and level of athletic performance for each of the three factors are presented and discussed. Within the framework of the research results, specific strategies for stress management in elite athletes are also suggested.

Keywords: stress, elite sportmen, high sportive performances

1. Introduction: general considerations on stress

The study of stress and anxiety in relation to sportive performances of elite sportmen caught the attention of specialists due to the debates of the psychological profile of high performance sportmen.

An elite sportman must be able to face critics, pain, defeat, physical and mental errors and other sources of stress (Anshel, 1997). Moreover, he must be able to cope with the stressing situation by means of specific strategies of stress management or simply ignore the sources that generate negative emotions during the game. His inability to apply personal stress management laws directly falls on the level of sportive performance (Krohne and Hindel, 1988). Investigations proved that the nature of personal stress management strategies are strongly related to the success and failure in big sports events: thus the strategies that focus on stressing factors and their overcoming are less efficient in the case of high performance sportmen (Krohne and Hindel, 1988).

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Emotions are significant elements in the life of an elite sportsman. The constant concern of sportsmen and coaches is to identify and maintain an optimal level of anxiety which is one of the most important emotions that intervenes during sportive performances. Anxiety is always associated with other states or relevant emotions for the competitive life of a high performance sportsmen: arousal and stress. In his work, ”Stress and Personality”, Adriana Baban (1998, p. 4) shows that stress is usually mistaken for anxiety (when anxiety is actually one of the emotions in stress) and stress may be intensified by anxiety, by the term arousal, or even that of coping, considering that it contains the essence of stress. This last viewpoint is single dimensional as, generally speaking, stress is a multi dimensional process which includes: an internal or external agent called stressor or stressing factor; its evaluation; efforts to dominate, reduce or ignore it; complex effects on the mental and physical state.

The effects of anxiety may occur in very complex and unpredictable situations having an emotional potential that leads to an increase in the level of stress in elite sportsmen (Butt, Weinberg and Horn, 2003). Although many sportsmen use adequate personal strategies of stress management, there are also great sportsmen that lose control of their emotions and have weak performances in important competitions (Jones, 1995, quoted by Anshel, 1997).

In the context of more and more studies on the impact of anxiety and stress on sportive performances of elite sportsmen, explanatory theories were elaborated and strategies of efficient management were designed in the complex conditions of competitive cycles.

2. Stress and sportive performance

2.1. Conceptual delimitations and theories on stress

The last five decades characterized, defined, and theorized adaptation as explanatory variable of life itself in biological and behavioral sciences. The general syndrome of adaptation (SGA) was firstly described in 1936 by Hans Selye who also called it the biological syndrome of stress. The added value of H. Selye was the non-specificity of the response of the organism to any challenge.

Selye’s theory (1976) claims that any life situation that challenges the adapting mechanism generates stress. No one can and does not have to avoid stress; it is life itself and freeing oneself from stress leads to death. Therefore the occurrence of the hypothesis according to which there are two forms of stress: negative stress or distress which we currently refer to and positive stress or eustress. Distress is more likely to cause “the adaptation disease” as Seyle calls it.
or “the stress disease” even though research showed that both types of stress can be damaging in certain conditions; it is a matter of perception if one perceives a situation as being pleasant or unpleasant. The event itself is always a stressor.

Half a century later after the first reflections of Hans Selye on stress theory, the common core of research on this subject is the low degree in agreement and consent on defining stress. Despite criticism and inaccuracies, stress theory still interests specialists. R.S. Lazarus (cited by Baban, A, 1998, p. 3) gives the following answer to the criticism on the theory of stress: „the rigid demand for precision towards a term may annihilate scientific progress which is carried out through subsequent approximations and not a dogmatic narrow-mindness of the system of ideas. Tolerating a certain degree of ambiguity is important for creativity in science, as well as for any other field”.

Continuous technical and scientific progress, burdens of social life that put pressure on the adapting capacity of modern man could be a possible explanation for the theory of stress in science. Man is a living system that entirely depends on maintaining satisfactory relations with the environment. Failure of adaptation leads to a decrease in life quality, diseases or even death. Stress, including adaptation may be considered an operating concept in the research of relations between man and environment.

The absence of agreement in approaching stress reflects the incredible extent of research in various directions which sometimes seem contradictory but are related to the same subject.

By summarizing present theories of stress, we come to see that three different categories of definitions coexist: stress as response, as stimulus and as interaction; these theoretical paradigms generated different methodological tendencies of approaching stress under one of the three aspects, i.e. physiological, sociological and psychological.

2.2. The issue of stress in the context of high performance sports

Most studies on stress and its impact on competitive sports show that the phenomenon is associated with anxiety which may contribute to an increase in the level of stress.

Besides the dichotomy distress-eustress, hyperstress and hypostress occur in the same contradictory relation (Selye, 1983, cited by Baban, 1998). Hyperstress is specific to situations in which the level of stress is so high that its over passing becomes quite difficult. Hypostress intervenes when the person suffers from a lack of stimulating events (physical immobility, state of intense boredom).
Another way to analyze the discussed phenomenon belongs to Martens (1982, cited by Cox, 1998) and McGrath (1970, cited by Cox, 1998), who associate stress as a process with anxiety as a state. This process is explained in relation with objective demand which is perceived as a threat that ultimately leads to a strong reaction/response (a manifestation of anxiety as a state). Objective demand is a stimulating situation that includes the sportsman. The way in which he perceives demand – either as a threat or not – depends on the subjective evaluation of the situation and the interactive effect of anxiety as feature. The relation between objective situation and response may be also explained in the terms of an unbalance: the sportsman perceives himself as being unable to efficiently cope with the given situation which he perceives as a threat.

Theoretically, many specific sources of stress can be identified. Sportive psychologists proved that important events in life provoke stress, damaging physical and mental health (Willis and Campbell, 1992, cited by Weinberg and Gould, 1997). In sportsmen, stress factors include the desire to make a difference, costs, time of coaching, doubts of their own talent traumatizing relationships or experiences of the sportsman’s life (Scanlan, Stein and Ravizza, 1991, cited by Weinberg and Gould, 1997). The sources of stress specific to the area of high performance sports may be classified according to situation and the individual’s personality as follows (Weinberg şi Gould, 1997):

- According to the situation, stress sources may be: social importance given to the event or competition and the uncertainty of the result (Martens, 1987).

  Generally speaking, the more important the sports event, the higher the stress of the sportsmen involved.

  The significance of a sports event is perceived in a different manner and subjectively by every participant. For instance, an internal soccer game is not as important as a game in the European Cup. Moreover, the former game may be perceived differently by the players of the same team: while the majority of sportsmen do not perceive the event as a source of stress, some of them may give special importance to the game as they are fully aware that they may be selected to play in a foreign team based on their performance.

  The greater the uncertainty of the result of a sportive competition, the higher the level of stress. In competitions that include similar performance sportsmen, the degree of uncertainty is higher.

- According to the personality of the individual, the sources of stress may be the following: anxiety as trait and self respect (Scanlan, 1986).
Anxiety as trait is a personality factor that determines the perception of sportive competition differently: sportsmen that show more anxiety perceive the competition as a threat.

Low self esteem also contributes to the perception of sportive competition as a threat.

M. Epuran (2001) makes an inventory of the stressing factors in training and sportive competitions in Romania, drawing the following list:

- Inadequate organization of sportive competitions, delays, aggressive behavior in coaches and fights with them;
- Long training in the same location which increases monotony;
- Psycho-social conditions shown in inadequate relations between sportsmen and coaches, sportsmen and managers, coaches and their family;
- Lack of a reasonable financial motivation to obtain great performances which will make worthy the intense effort specific to competitions;
- Used and inadequate equipment as compared to the other competitors’ one;
- Former belonging to the Eastern Europe communist countries;
- Social factors: school, occupation, family, etc.;
- Lack of rehabilitation pauses after demanding competitive seasons with many difficult and stressing events.

The same author (Epuran, 2001) mentions that identifying the manifestation of stress in sportsmen may be achieved through indicators that trigger them such as:

- **Physiological** (increase of heart beats, modifications of arterial tension, increased breathing rhythm, stomach aches, etc.);
- **Behavioral-motric** (trembling, fine motric coordination disorder, increase in the number of mistakes, etc.);
- **Psychical** (uncontrolled and inadequate behavioral relations to the moment of action, increased irritability, negative thoughts, etc.).

### 3. An empirical study on stress in elite athletes

#### 3.1. Purpose and aims of the research

This study aims at the investigation of the stress level in Romanian athletes with average and high level performance and at identifying links with this process associated with the success/ failure in competitive activity through:
The study of the influence that a series of variables (the level of involvement in a sport, the sport played and the biological genre) exert on the level of stress in the two categories of sportsmen included in the research samples.

Taking some preliminary steps was necessary; they involved:
- Building and validating an instrument of evaluating stress in athletes;
- Applying the instrument on two samples consisting of high performance sportsmen (members of national teams, participants to national and international competitions), and average performance sportsmen (participants to local and regional competitions).

3.2. Hypotheses for research

General hypothesis: The level of practicing a sport (of high and average performance), the sport involved and the biological genre significantly influence the level of perceived stress.

Specific hypotheses
- High performance athletes show higher stress than average sportsmen especially with respect to the time of competition;
- For participants to individual sports (athletics, gymnastics, etc.) there are higher levels of stress than in team sports (handball, football);
- Sportswomen show higher stress than sportsmen (both in high performance teams and in average performance teams).

3.3. The research sample

The sample involved in the test included a total number of 240 individuals, of which 120 high performance athletes and 120 average athletes, 122 women and 118 men. The distribution of the research sample according to the level of practicing a sport and the type of sport is shown in Table no. 1.
### Table no. 1 – Distribution of the research sample according to the level of practicing a sport and the type of sport (Cross tabulation)

<table>
<thead>
<tr>
<th>The sport practiced</th>
<th>Athletics</th>
<th>Of high performance</th>
<th>Of average performance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gymnastics</td>
<td>30</td>
<td>34</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>fencing</td>
<td>21</td>
<td>17</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>canoeing*</td>
<td>15</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>handball</td>
<td>28</td>
<td>32</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>football</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>120</td>
<td>120</td>
<td>240</td>
</tr>
</tbody>
</table>

* The canoeing sportsmen included in the research sample compete in teams (4+1 and 8+1); therefore, this branch was considered to be a team sport in our study.

### 3.4. Instruments of research

For evaluating stress, a scale which was especially built for this purpose was used; it includes twenty eight adjectives that emphasize the intensity of emotions before the beginning of a sportive competition, during the event and after its end. The subjects have to assess the extent of emotional stress in their personal profile in the three moments on a Lockert scale (1 = little; 5 = very much).

Due to the nature of adjectives used in the scale, we have foreseen their grouping in a series of factors. Consequently, we carried out a factorial analysis on main components with Varimax rotation. We have chosen a three factor solution that explains 47.15% of the total variation of results (Factor 1 - 21.03%; Factor 2 - 13.62%, Factor 3 - 12.49%). One of the „merciful” items was excluded from the final variant of the scale as it did not respond to any factor.

Factor 1, whose content is contained in the syntagm physical and mental burnout includes twelve items, Factor 2 – competitive demand comprises eight items and factor 3 – activism comprises seven items.

The homogeneity of the instrument was evaluated irrespective of the three factors and the following results were obtained: for the burnout scale $\alpha = 0.87$, for the competitive demand scale $\alpha = 0.84$; for the activism scale $\alpha = 0.76$. 

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3.5. Research procedure

The research was carried out from March 2006 to February 2008 and the instrument was administered by the subjects themselves. The research instrument was applied in a single session, individually, respecting the training programme of the sportsmen included in the sample. Most high performance athletes were contacted in-between competition periods, during their training for national and international contests except for the handball and football players that were taking part in competitions.

4. Analysis and interpretation of results

A mixed analysis was carried out to investigate the influence of the extent to which a sport is practiced, the sportive branch and the genre on self-assessed stress by subjects before the beginning of the competition, during the competition and after its end. Due to the impossibility to apply the research instrument in the three moments (ergo the longitudinal approach of the research process), we used retrospective self-assessment of the subject as a basis for this analysis.

In the case of the first factor – burnout, there is a statistically significant interaction effect, where the influence of the level of practicing a sport on burnout in the three moments is significant \[F(1, 238)= 8.84; p= 0.003\]. There is also a main effect which is significant, i.e. of the moment of competition on burnout \[F(1, 238)= 80.62; p= 0.000\] but there is no main effect which is significant for the level of practice of a sport on burnout \[F(1, 238)= 0.339; p= 0.561\]. Thus, the level of burnout during competition is significantly higher in the case of high performance sportsmen, yet both categories have low levels of burnout between and after the end of the competition and higher levels during the competition.

In the case of the second factor, i.e. competitive demand, the interaction effect is not statistically significant and the influence of the practicing level of a sport on competitive demand in the three moments in not significant \[F(1,86, 443.098)= 0.106; p= 0.887\]. There is no statistically significant main effect of the level of practicing a sport on competitive demand \[F(1, 238)= 1.200; p= 0.274\]; however, there is a statistically significant main effect of the competitive moment on competitive demand \[F(1,840, 437,992)= 118,043; p= 0.000\], demand being higher before the beginning of the competition and decreasing alongside with the end of the competitive moment.

For the third factor, i.e. activism, there is a statistically significant effect of interaction where the influence of the level of practicing a sport is significant for activism in the three moments \[F (1,52, 361,747) = 5.265; p = 0.011\]. Moreover,
there is a statistically significant main effect of the competitive moment on activism \([F(1,52, 361,747)= 279,694; p= 0.000]\) and there is no significant main effect of the level of practicing a sport on activism \([F(1, 238)= 0.683; p= 0.410]\). Thus, high performance sportsmen have a high degree of activism before competition, yet lower during the competition and after its end, irrespective of the level of practicing the competitive sport. The activism of sportsmen is higher before competition, decreases during competition and tends to increase after the end of the competition.

For a detailed evaluation of the level of practicing a sport on the level of stress, a series of T tests were carried out for independent samples for each delimited factor. Results show that high performance sportsmen have a significantly higher level of activism than average sportsmen before the competition \([t(238)= 2.48; p=0.014; M_1= 27.84; M_2= 26.19]\), whilst the sense of difference reverses in the competitive situation. Thus, high performance sportsmen perceive a significantly lower level of activism as opposed to average performance sportsmen \([t(225,45)= -2.26; p=0.024; M_1= 14.25; M_2= 15.68]\) (see Chart no. 1). For the other factors of the stress evaluation scale (burnout and competitive demand) and for the situation of sportsmen after the end of the competition, significant effects of the level of practicing a sport have not been obtained.

**Chart no. 1 – Average scores for the factor activism according to the level of practicing a sport**

![Chart showing activism levels before and during competition for high and average performance athletes.](chart1.png)
The same algorithm was applied to the study of influence of the sportive branch on stress. For the relation sportive branch – level of stress, before, during and after the competition, a mixed variation analysis was carried out.

There is a statistically significant interaction effect and the influence of the sportive branch on burnout in the three moments is significant \( F(5, 234)= 4.04; p= 0.002 \). Moreover, there is a significant main effect of the competitive moment on burnout \( F(1, 234)= 76.406; p= 0.000 \) and there is no significant main effect of the sportive branch variable on burnout \( F(5, 234)= 2.002; p= 0.079 \). Thus, for all sportsmen, the level of burnout is lower before and after the competition, being higher during it; however, sportsmen in team sports are more burnout during competition than individual players (in athletics, gymnastics and fencing).

For factor 2, competitive demand, there is no statistically significant interaction effect; the influence of the sportive branch on competitive demand in the three moments is non significant \( F(9,52, 445,716)= 0.951; p= 0.483 \). However, there is a significant main effect of the competitive moment on competitive demand \( F(1,905, 445,716)= 110,558; p= 0.000 \) and there is no significant main effect of the sportive branch variable on competitive demand \( F(5, 234)= 1.149; p= 0.335 \). Thus, competitive demand seems to decrease with the competition, being higher before the competition, decreasing during the competition and diminishing even more after the competition, regardless of the sportive branch involved.

In the case of the third factor, i.e. activism, there is no statistically significant interaction effect and the influence of the sportive branch on activism in the three moments is not significant \( F(7,43, 347,83)= 0.719; p= 0.665 \). However, there is a significant main effect of the competitive moment on activism \( F(1,486, 347,830)= 224.087; p= 0.000 \) and also a significant main effect of the sportive branch variable on activism \( F(5, 234)= 5.169; p= 0.000 \). Thus, activism has the highest values before the competition, decreases during the competition and seems to increase again after the competition, regardless of the sportive branch involved.

In order to show the significant difference between groups of subjects involved in various sports, a simple variant analysis (Anova One-Way) was performed. Its results show significant differences only for burnout during competition \( F(5)= 2.64; p= 0.024 \) and for activism after the competition \( F(5)= 2.27; p= 0.048 \). Posthoc tests (Bonferroni) suggest that in the former significant situation, soccer players obtained the highest scores for burnout during competition, while in the latter situation, the same group obtained significantly lower scores for activism, after the end of the competition.
To study the influence of genre on stress, a series of mixed variant analyses were applied. In the case of the burnout factor, there is no statistically significant interaction effect; the influence of genre on burnout in the three moments is not significant [F(1, 238)= 0.036; p= 0.850]; however, a significant main effect of the competitive moment on burnout was recorded [F(1,238)= 77.665; p= 0.000]. Moreover, there is no significant main effect of the genre variable on burnout [F(1, 238)= 1.436; p= 0.232]. Thus, burnout is lower than before the competition, it increases before the start of the competition only to decrease again after the end of the competition, regardless of the subjects’ genre.

In the situation of the third factor, i.e. competitive demand, there is a statistically significant interaction effect; the influence of genre on competitive demand in the three moments is significant [F(1,87, 446,85)= 5.36; p= 0.006]. A significant main interaction effect of the competitive moment on competitive demand is also recorded [F(1,87, 446,85)= 119.774; p= 0.000], as well as the genre variable on competitive demand [F(1, 238)= 8.281; p= 0.004]. Thus, although competitive demand seems to decrease alongside with the competition, competitive demand in women is higher before and during the competition than in men; after the end of the competition these differences of genre tend to become equal; therefore, women perceive more significantly this dimension of stress.

In the case of activism, there is no statistically significant interaction effect, the influence of genre on activism in the three moments being non significant [F(1,49, 355,71)= 2.45; p= 0.103]. However, there is a significantly main effect of the competitive moment on activism [F(1,49, 355,71)= 276.951; p= 0.000] and there is a significant main moment of the genre variable on activism [F(1, 238) = 14.275; p= 0.000]. Thus, irrespective of the subjects’ genre, activism is higher before competition, it decreases during competition and tends to increase again after the end of the competition; furthermore, regardless of the competitive moment, women’s activism tends to be higher than that of men.

For a detailed study of the effect of genre on the dimensions of stress, the t test for independent samples was applied, revealing significant differences between women and men for burnout, competitive demand and activism. For all the three factors, significantly higher scores are recorded in women: for activism, the value of t(238)= -2.03; p= 0.04 (M m = 46, 83; M f = 50, 45), for burnout t(238)= -2, 08; p= 0.03 (M m = 47, 44; M f = 51, 48), and for activism t(238)= -2.52; p= 0.01 (M m = 53, 96; M f = 58, 52).
5. Conclusions

The design of our survey allowed the study of an important factor in determining sportive performance: (pre-competitive, competitive and post-competitive) stress. The independent variables aimed at in the context of research (level of practicing a sport, sportive branch and genre) are used in most specialty studies. They are the basis for explanations on stress variability between various categories of high performance sportsmen. Having the results of the analysis as a starting point, we assess that the hypotheses of research have been partially confirmed and their synthesis allows us to relate our study to the specific strategies/models of stress management.

The main results on the level of stress in sportsmen are the following:

- High performance sportsmen obtained significantly lower scores than the average ones for the burnout factor during competition, yet both categories of sportsmen recorded lower scores before and after the end of the competition;
- Competitive demand is not perceived differently by average sportsmen and high performance ones and it decreases alongside with the end of the competition;
- High performance sportsmen have a significantly higher level of activism before the competition which decreases in the other two moments;
- Players involved in team sports (such as football, canoeing or handball) perceive burnout more significantly during competition, as opposed to individual players (of athletics, gymnastics, fencing). Soccer players obtain the highest results for burnout during competition and the lower scores for activism after the end of the competition;
- There are no significant influences of the peculiarity of sportive branches on competitive demand and activism;
- The influence of the genre on the perception of burnout and activism is not significant, yet girls have a stronger perception of competitive demand.

These results are generally in accordance with the data in literature, showing the need to use specific devices for stress management which involve building a self control capacity, among others.

Specialists suggest a series of strategies for dealing with stress in order to contribute to an increase in the level of self control and ensure the efficiency of the activity of elite athletes. Thus, T. Orlick (1986, cited by Anshel, 1997) mentions two types of stress management strategies in sportsmen: a) planning each aspect of the motric act that will be involved during competition and b) designing behavioral alternatives for every planned action. Moreover, the author suggests that the best
way to prevent situations of panic is to design and implement solutions before the stressing events escape control or even before they occur.

In 1990, M. H. Anshel (1997) designs the COPE model, which describes the cognitive-behavioral strategies to cope with the serious forms of stress caused by negative reactions of others (be they coaches, team players, spectators or arbiters). The model is an abbreviation of four cognitive-behavioral strategies:

- **C – emotion control.** In situations of exposure to hostilities of the people around us, the first reaction of a sportsman is that of physical and mental tension. The types of response are analyzed by specialists by means of the „fight-or-flight” reflex of the sympathetic nervous system. The control of emotions is achieved through regulated breath which also leads to a regulation of muscular tension. In this stage, relaxation techniques that slow somatic processes and inhibit thought and rapid reactions are not recommended. Even if the sportsman applies techniques to control his emotions, he must remain conscious and receptive to all information that can contribute to his performance.

- **O – organizing external information and reactions.** The aim of this strategy consists in the rational dealing with a stressing episode. The elite athlete is capable of processing a piece of information or an important event, as opposed to a less important one. Besides ordering information in a hierarchical manner according to its relevance, the following techniques may be used: ignoring the stressing episode during competition or focusing on urgent tasks.

- **P – planning the response.** A high performance sportsman does not focus on unpleasant feelings and this capacity keeps him in the optimal shape for the next step of the competition. In this moment, the sportsman’s ability to digest relevant information in a plan of action intervenes. Thus, he becomes aware of the opponents’ advantages and disadvantages or corrects his own actions.

- **E – executing the plan of response.** Any elite sportsman reacts with precision and speed to stressing situations and a part of these responses become skills in time.

During the past years other cognitive strategies to prevent accidental or chronic stress have been designed. One of these strategies consists in minimizing the importance of unwanted messages (i.e. angry remarks of the coach)
unpleasant experiences (such as low performances). This technique helps in organizing information according to its relevance for the activity of the sportsman.

The systematic study of stress as phenomenon that interacts with other processes and determining traits in high sportive performance is particularly significant. The study of the sources of stress, such as experimenting various stress management strategies could shed light on the impact of the phenomenon on performance sportive activity and contribute to a better training for big sportive events.

REFERENCES


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Hanson, T. W., Gould, D. (1988). Factors affecting the ability of coaches to estimate their athletes’ trait and state anxiety levels, The Sport Psychologist, 2, pp. 298 - 313


Kierkegaard S., 1998, Conceptul de anxietate, Editura Amarcord, Timișoara;


Percek, A., 1992, Stresul și relaxarea, Editura Teora, București

Perry, J.D., Williams, J.M., 1998, Relationship of intensity and direction of competitive trait anxiety to skill level and gender in tennis, Sport Psychologist, 12, pp. 169-179


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