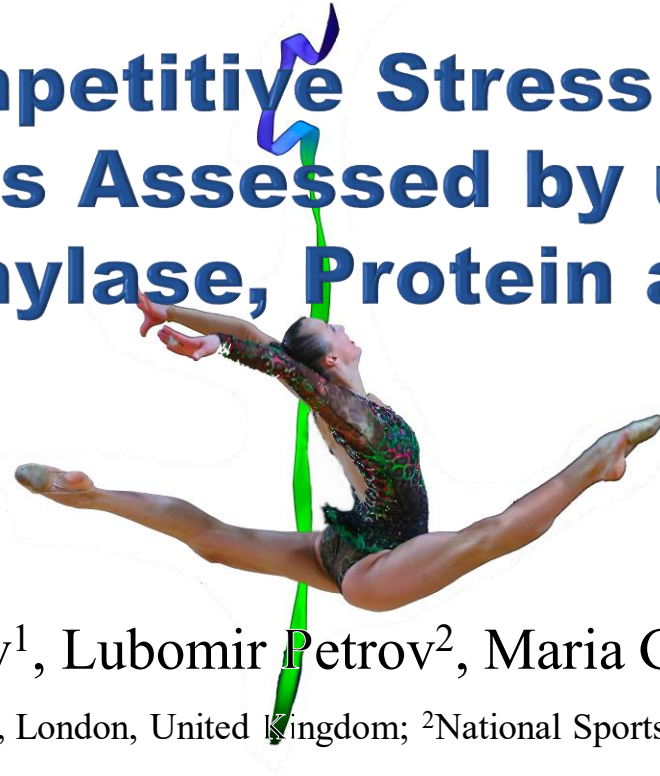


Precompetitive Stress in Rhythmic Gymnasts Assessed by using Salivary Alpha-Amylase, Protein and Potassium



Stefan Kolimechkov¹, Lubomir Petrov², Maria Gateva², Albena Alexandrova²

¹STK Sport, London, United Kingdom; ²National Sports Academy, Sofia, Bulgaria

Aim of the Study

The purpose of this study was to assess the pre-competitive stress levels in rhythmic gymnasts by using non-invasive biochemical methods and anxiety questionnaires.



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Methods

- **Participants**

10 rhythmic gymnast competitors (age: 14.7±1.57 years), at the Bulgarian Rhythmic Gymnastics Championships.

- **Study design**

Saliva was collected by using cotton swab salivates without salivary stimulation at three different times: at **home** nine days pre-competition (baseline), before a **training session** five days pre-competition, and just before the **competition**.



Salivates were transported to the laboratory by using a portable cool bag. The Salivary alpha-amylase (sAA) activity and the concentration of salivary protein (sP) and salivary potassium (K^+) were measured by using:

- sAA colorimetric test kit, (REF E12 218A, EMAPOL, Gdańsk, Poland);
- Total Protein liquicolor test kit, (REF 10570, HUMAN Gesellschaft fur Biochemica und Diagnostica mbH, Wiesbaden, Germany);
- Potassium liquirapid test kit, (REF 10118, HUMAN Gesellschaft fur Biochemica und Diagnostica mbH, Wiesbaden, Germany).

Trait and state anxiety were evaluated by using the Spielberger State-Trait Anxiety Inventory.

Comparisons were made using one-way ANOVA with repeated measures.



Results

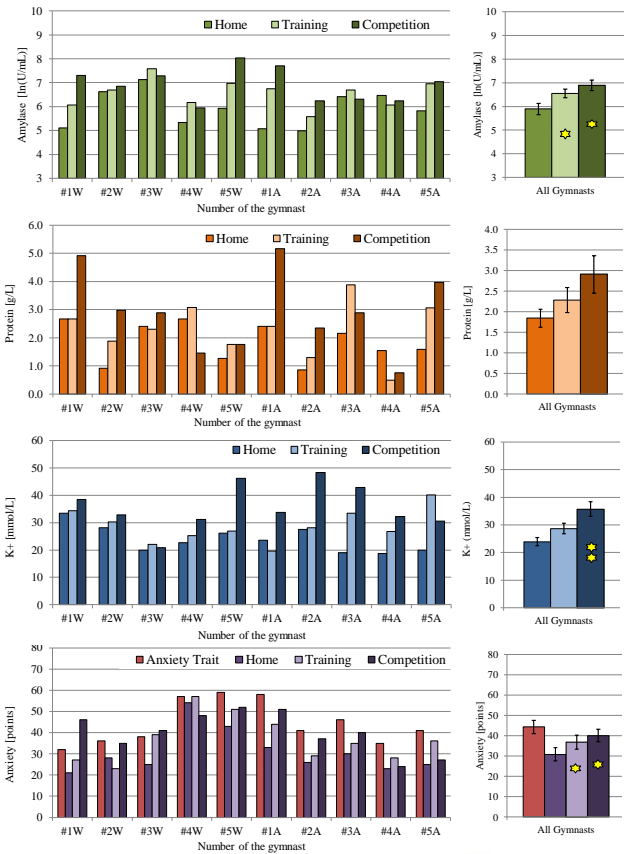


Table 1. Salivary alpha-amylase activity, salivary protein and K⁺ concentrations of all gymnast (n=10) on the 9th day before the competition (Home), just before the training session (Training), and before the competition (Competition).

	Home	Training	Competition
sAA activity [ln(U/mL)]	5.89 ± 0.75 ^{bc}	6.56 ± 0.58	6.90 ± 0.70
Salivary Protein [g/L]	1.84 ± 0.70	2.28 ± 0.97	2.91 ± 1.44
Salivary K ⁺ [mmol/L]	23.94 ± 4.83 ^c	28.69 ± 6.10	35.73 ± 8.30
State Anxiety [points]	30.80 ± 10.26 ^{bc}	36.90 ± 11.03	40.10 ± 9.57
Trait Anxiety [points]	44.30 ± 10.20	NA	NA

^b – p < 0.05 vs Training

^c – p < 0.05 vs Competition; ^c – p < 0.01 vs Competition



Conclusion

- The sAA activity and salivary K^+ concentration were both in agreement with the anxiety scores, and they can be applied as useful non-invasive biomarkers of stress.
- A combination of psychological, biochemical and physiological indicators should be used to establish a comprehensive assessment of stress in competitive sport.