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Table tennis performance indicators relationship under fatigue condition

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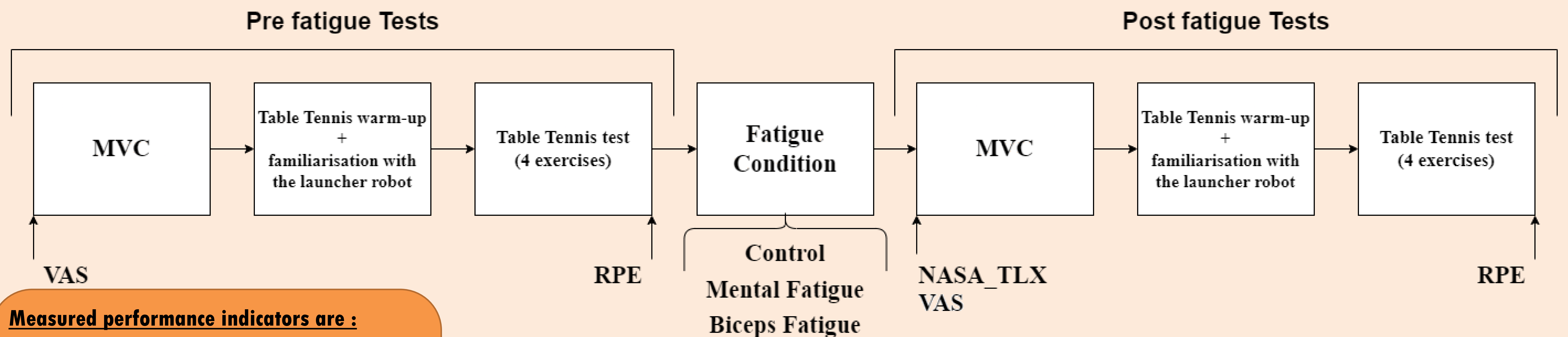
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Introduction & objectives

Table tennis is a complex sport involving many performance indicators such as ball speed, spin, racket acceleration, or foot-step patterns. Some of them showed sensitivity to fatigue in the work of *Lemansec et al. [1]*. Ball speed, precision, and numbers of faults showed a rise or a diminution in fatigue condition. But the variability of these performance indicators has never been studied to our knowledge, our study focuses on which fatigue could impact performance and at which level?

Materials & Methods

Nine players from the French table tennis national center of Nantes were selected to perform table tennis tests under 3 different fatigue conditions. Players are all men of 15±1,5 years and of French ranking points 2103±344 points (semi-professional). Players had to hit 30 balls launched by a ball thrower in 4 different exercises and 3 fatigue conditions. The original protocol is based on the work of *Le Mansec et al. [1]*. All participants had to perform the three test sessions. An overview of the protocol is presented below:



Measured performance indicators are :

- Ball Speed (m.s-1)
- Ball Spin (Rps)
- Acceleration (g)
- Precision (cm)

Variations were observed using the coefficient

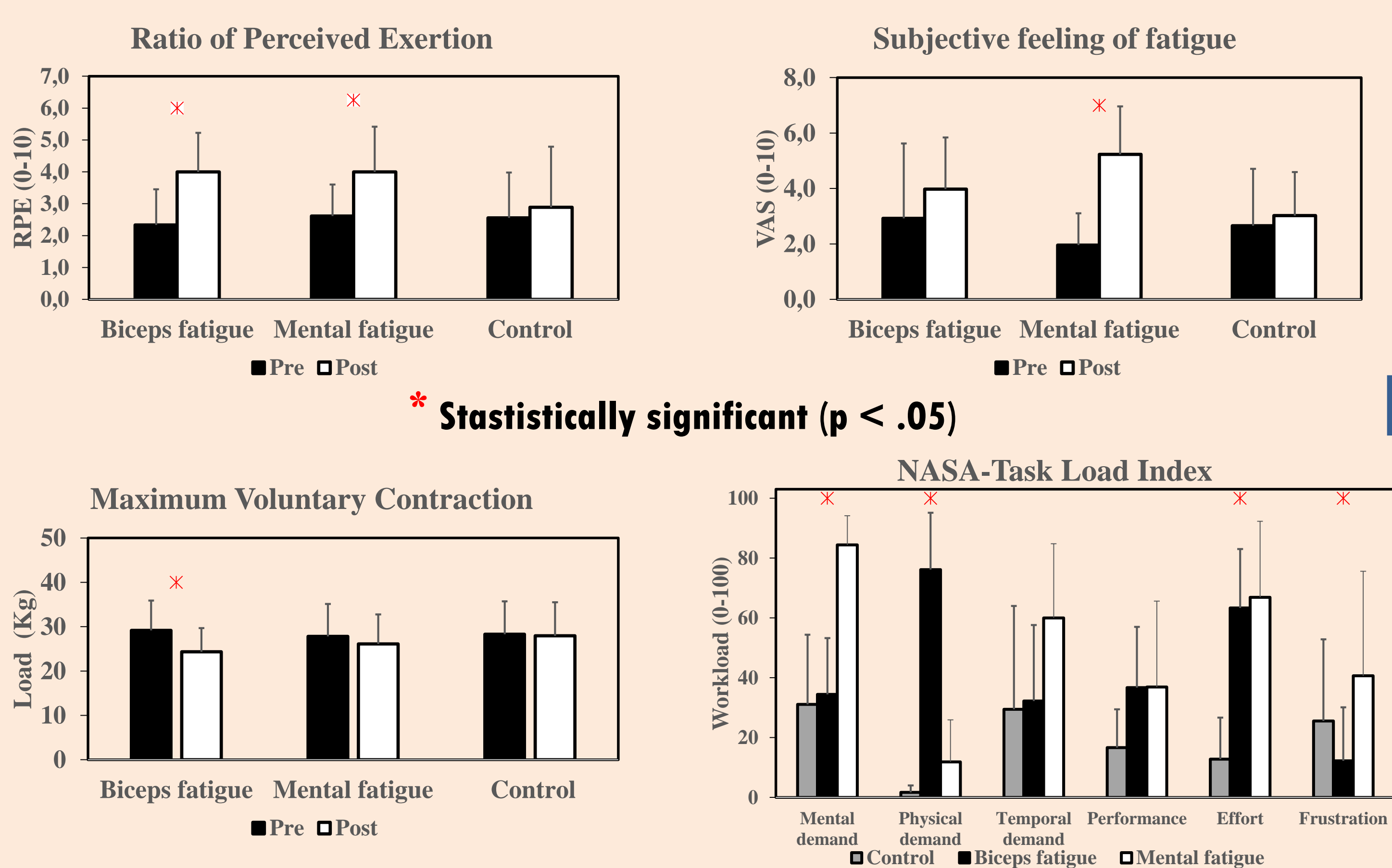
$$\text{of variation defined by } CV = \frac{\sigma}{\mu}$$

Markers of fatigue:

- Subjective feeling of fatigue measured with a visual analog scale (VAS)
- Ratio of Perceived Exertion (RPE), measured with Borg's scale [2]

Results & Discussion

Statistical analysis has been conducted by a two-way ANOVA using *Jasp* software.



Variation analysis of measured performance indicators pre/post

	Control		Biceps Fatigue		Mental Fatigue	
	Measure	CV	Measure	CV	Measure	CV
Max racket Acceleration	0	--	0	++	-	+
Ball's speed	0	0	0	+/-	0	+/-
Ball's spin	0	+	0	--/++	0	++/--
Precision	0	++	0	+/-	++	++

« 0 » → No impact : < ± 5% of variation

« +/- » → Small impact : ± 5-10% of variation

« ++/-- » High impact : > ± 10% of variation

Conclusions

1. Measurements made on a specific population
2. Fatigue has been induced
3. Mental fatigue affects mainly the precision and variability of performance indicators as a whole.
4. Neuromuscular biceps fatigue affects the kinetics of the ball indicators and their variability.

[1] Y. Le Mansec, B. Pageaux, A. Nordez, S. Dorel, et M. Jubeau, « Mental fatigue alters the speed and the accuracy of the ball in table tennis », *Journal of Sports Sciences*, vol. 36, n° 23, p. 2751-2759, 2018

[2] G. A. V. Borg, « Psychophysical bases of perceived exertion », *Medicine & Science in Sports & Exercise*, vol. 14, no 5, p. 377 381, 1982

