Impact of Osteopathic Treatment on Cervical Stability and Performance in Male Gymnasts Performing a Tucked Double Backflip

Mélanie Vignac[1], Julien Poli*[1], and Virgile Serrau[2]

[1]Ostéopathe – Holistéa – France
[2]Laboratoire Interdisciplinaire en Neurosciences, Physiologie et psychologie – Université Paris Nanterre, L'Institut Libre d'Éducation Physique Supérieur (ILEPS) – France

Résumé

Introduction

Artistic gymnastics requires exceptional strength, power, and agility, with even the smallest details playing a critical role in overall performance. Nikolai Andrianov, the most decorated gymnast in Olympic history, was the first to perform a double back tuck on floor, marking a significant milestone in the sport. Coaches emphasize the importance of cervical control in optimizing both rotation and landing during this complex element. However, no scientific study to date has conclusively demonstrated its impact on performance. This study seeks to investigate whether holistic osteopathic treatment, by focusing the cervical muscles, can positively influence gymnasts' execution of the tucked double backflip on floor.

Material and methods

Participants: Twelve male gymnasts from the Vélizy-Villacoublay gymnastics club participated in the study. Their ages ranged from 15 to 37 years. Inclusion criteria required that each participant had previously mastered the double back tuck on floor and had no recent injuries.

Design: A within-subject pre-post experimental design was used to assess the impact of a holistic osteopathic intervention. All participants underwent a standardized evaluation protocol before and after treatment.

Measurement tools:

- Video Analysis: The Kinovea software was used to analyze performance during the double back tuck on floor. Key variables included jump height, trajectory length, sternum-to-chin angle, and pelvic rotation speed. Two iPhones, mounted on fixed tripods in consistent positions, were used to record the performances.

- Likert Scale Questionnaire: Participants completed a self-assessment questionnaire using a Likert scale to report their perceived performance quality.

*Intervenant

- Postural Tests: The Barré vertical test and the Fukuda stepping test were conducted to evaluate static and dynamic postural control, respectively.

- Cervical Strength Assessment: A Gatherer System dynamometer was used to measure maximum voluntary isometric strength of the cervical muscles in both flexion and extension.

Procedure:

The protocol was divided into three stages. The baseline assessment: Initial measurements were taken, including video recordings of the double back tuck, postural assessments, and cervical muscle strength testing. The Osteopathic Treatment: Participants received a holistic osteopathic session involving structural and myofascial techniques, tailored to each individual. And the post-treatment assessment: The same set of measurements conducted at baseline was repeated to assess the effects of the osteopathic intervention.

Results

The data were analyzed statistically using Statistica software, employing Student's t-test, two-factor ANOVA, and linear regression. The statistical analysis revealed significant improvements in the maximum voluntary strength of the cervical muscles during flexion ($p < 0.001$) and extension ($p < 0.001$) following osteopathic treatment. Additionally, there were improvements in biomechanical parameters related to the execution of the double back tuck on the floor, notably a significant increase in jump height ($p = 0.0015$) and pelvic rotation speed ($p = 0.046$), as well as a significant decrease in the length ($p < 0.001$) and angle of the sternum and chin ($p = 0.049$) between pre and post osteopathic treatment. The gymnasts' perceived performance quality ($p < 0.001$) and posturological test scores ($p < 0.001$) also improved significantly after osteopathic treatment. Strength gains, reductions in chin-sternum amplitude and posturological modifications did not show a significant correlation with performance indicators of the double back salto (height, distance, rotational speed; $p > 0.05$).

Conclusion

This study demonstrates that osteopathy can positively influence the performance of gymnasts executing a double back tuck on the floor. Utilizing a three-phase protocol (comprising initial measurements, osteopathic treatment, and subsequent measurements) the results indicate a significant improvement across all evaluated parameters. However, no correlation was identified that could determine the most influential parameter associated with the osteopathic effect on performance enhancement. The findings suggest that osteopathy may contribute to improved performance and cervical stability; nevertheless, further research is warranted to investigate the medium- and long-term effects of treatment, involving a larger sample size and a control group. This study offers a scientific perspective on the empirical knowledge held by gymnastics coaches and opens avenues for the systematic incorporation of osteopathy into gymnast training programs to optimize performance. Overall, the results support the hypothesis that osteopathy can enhance performance and neck stability during a tucked double backflip on the floor in male gymnasts.

Keywords
Osteopathy, Performance, Artistic gymnastics, Double back tuck on floor, Cervical muscles strength.