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¹H NMR Urinary Metabolomic Analysis in Recreational athletes: effect of physical exercise and whole body cryostimulation



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Introduction

Physical exercise induces various metabolic changes, influencing energy expenditure and substrate utilization (1). Metabolomics provides a comprehensive understanding of the metabolic adaptations occurring in response to physical exercise and recovery (2,3). In this study, we assessed the impact of sub-maximal cycling exercise (SMC), high intensity interval training (HIIT) and cryotherapy recovery on urine metabolome.

Results

PCA analysis revealed a distinct separation between the urine NMR profiles of experimental (WBC) and control (CTL) groups induced by SMC. However, these changes appeared to be more pronounced in the CTL group.

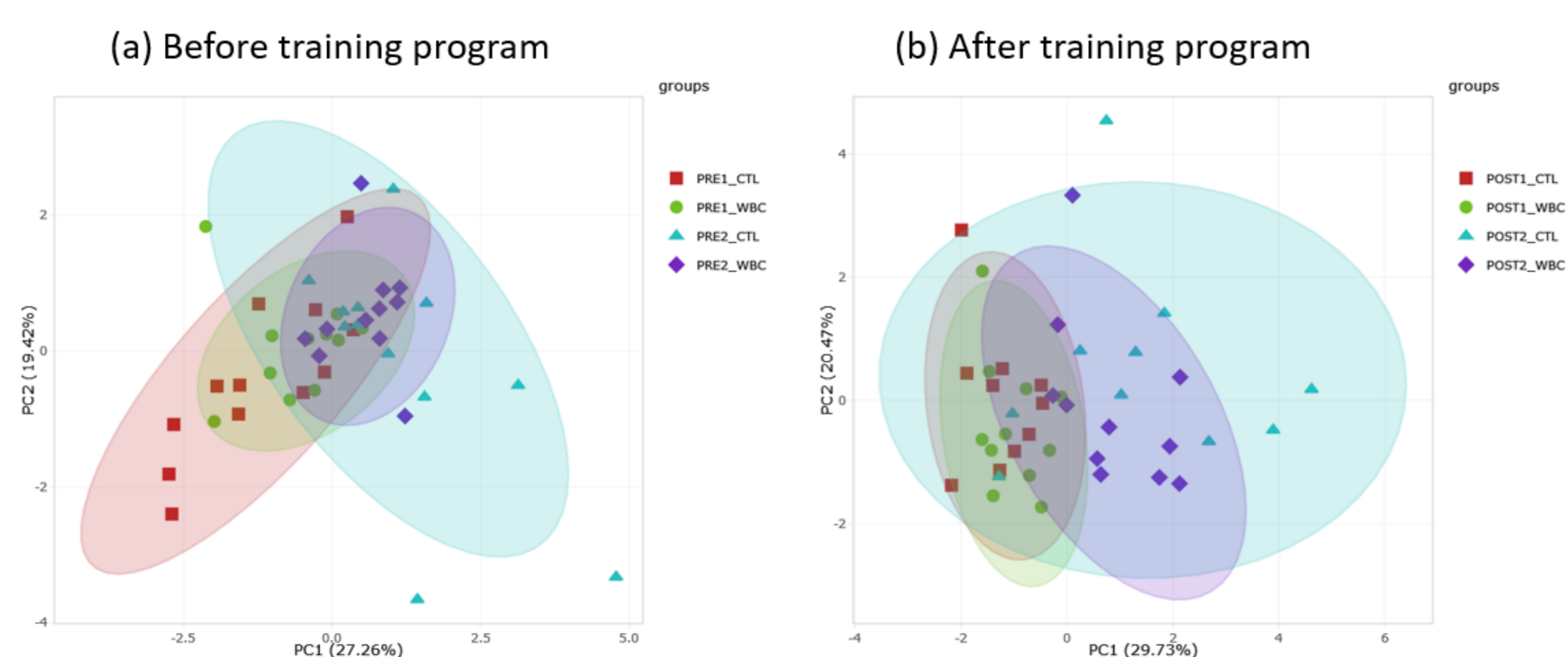


Figure 3: Score plots of principal component analysis for participants (a) before training program (PRE) and (b) after training program (POST). In the legend, 1 means before SMC, and 2 means after SMC.

The main metabolic variations (Figure 4) concerned 7 identified metabolites: **lactate, adenine, alanine, citrate, formate, N-phenylacetylglutamine, urea and acetate.**

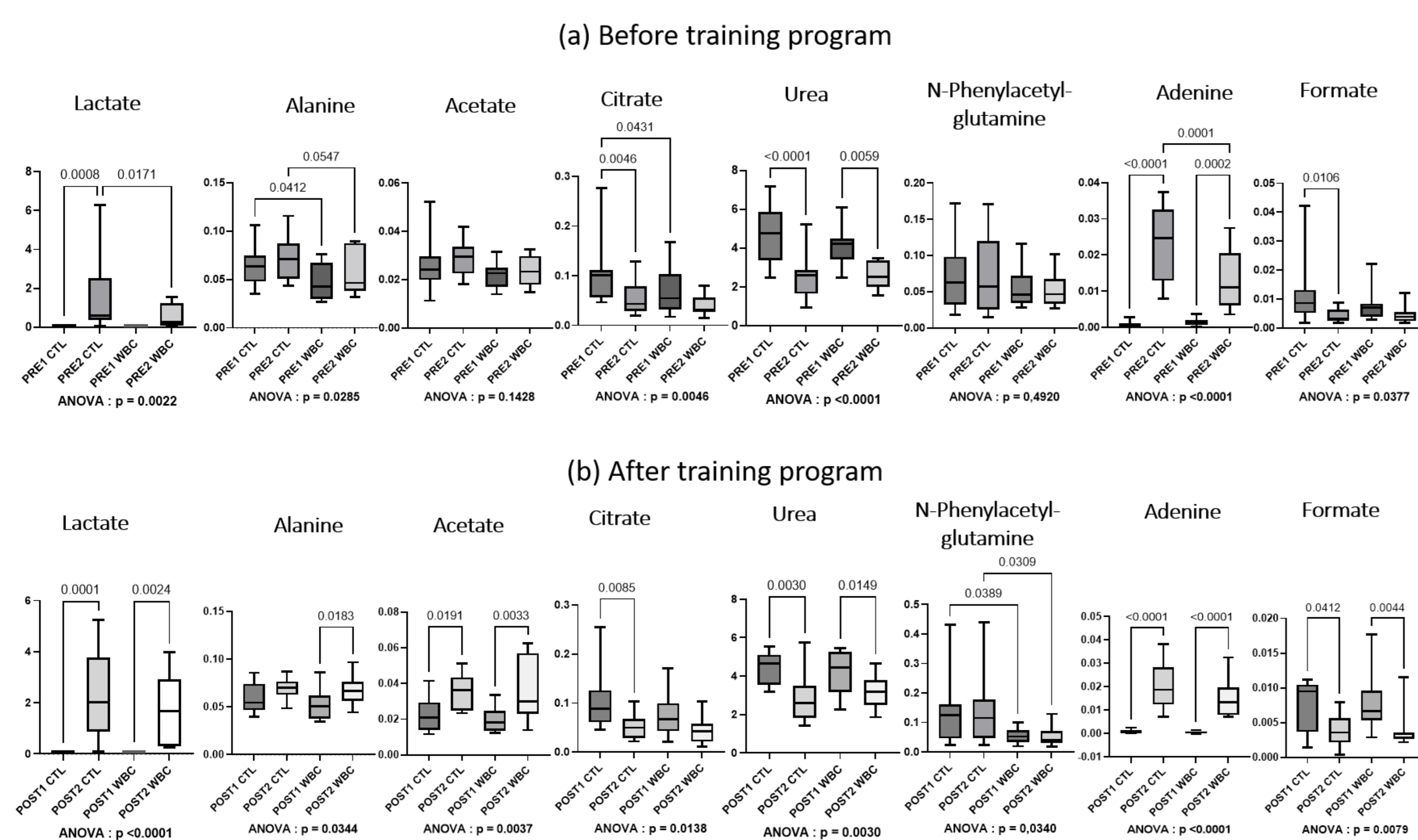


Figure 4: Box plots of targeted metabolites for participants (a) before training program (PRE) and (b) after training program (POST). In the legend, 1 means before SMC, and 2 means after SMC.

Methods

At the beginning and at the end of the HIIT program, participants performed 2-h SMC at 60% of power aerobic peak followed or not by a WBC session. Urine specimens were collected before and 30 minutes after SMC (figure 1).

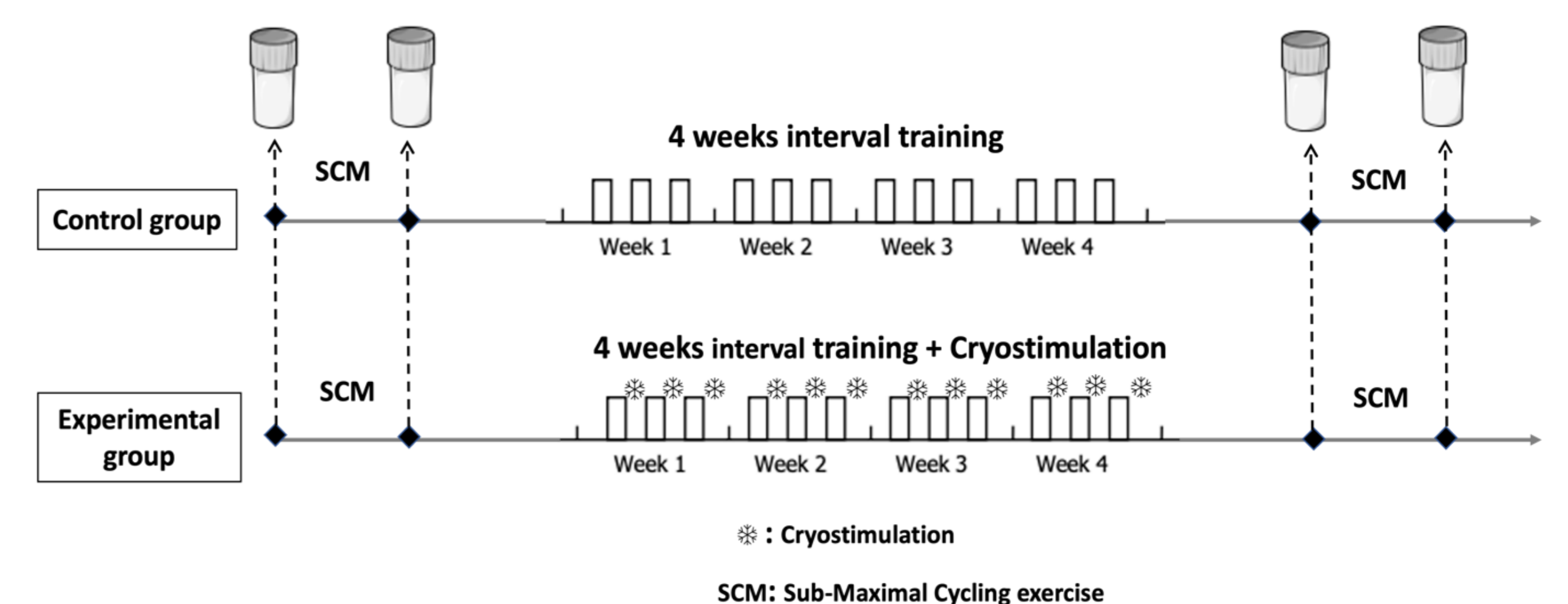


Figure 1: Study protocol

The specimens were analyzed with ¹H NMR spectroscopy (Figure 2).

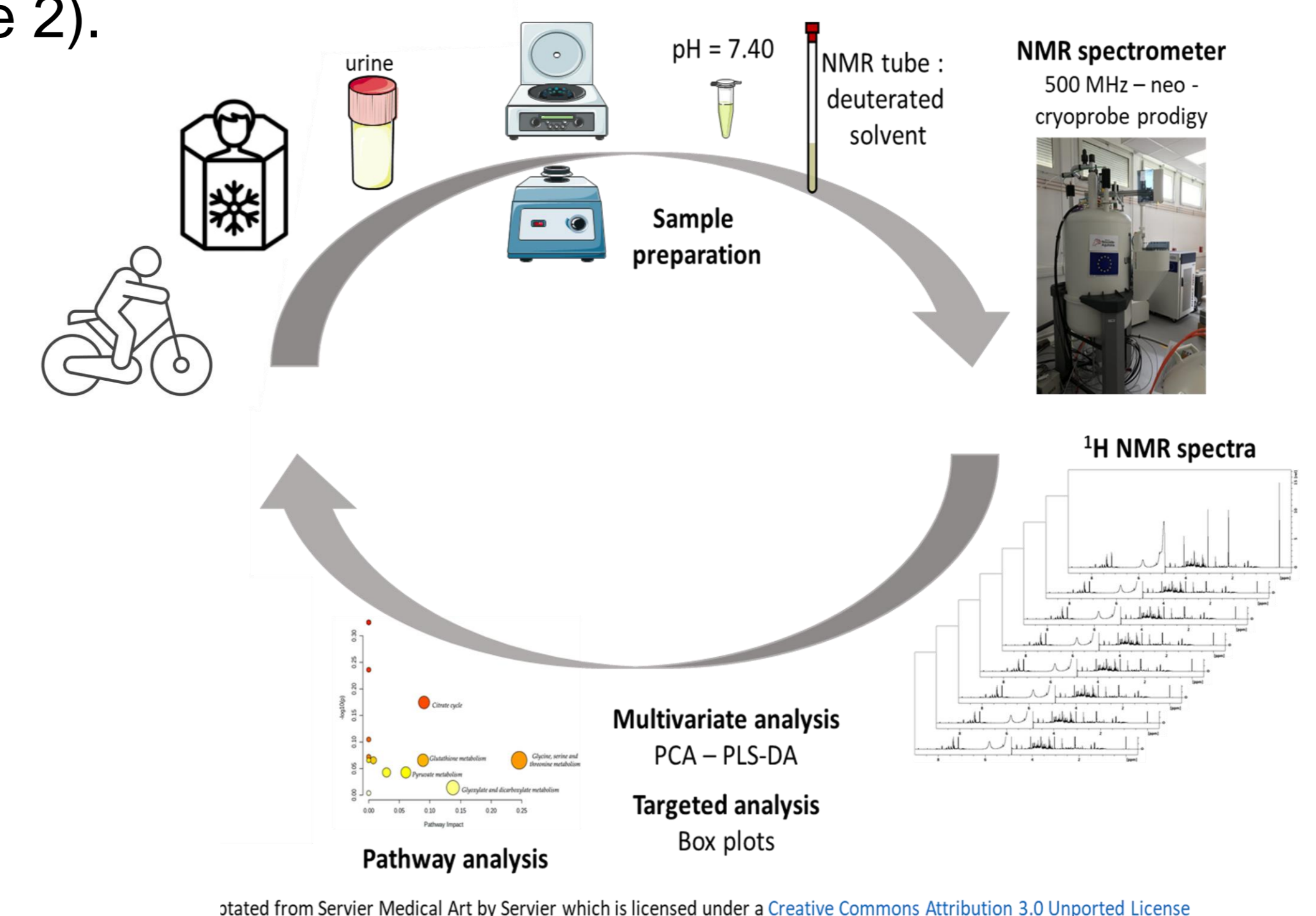


Figure 2: Sample preparation and ¹H NMR spectroscopy analyzes

Conclusion

SMC-induced changes appeared more pronounced in the CTL group when compared to the WBC group following HIIT. The metabolic adaptations associated with SMC and HIIT contribute to a more comprehensive understanding of their combined effects and offer a distinctive perspective for unraveling the effects of physical activity and recovery on metabolic pathways.

References

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