The Combined Impact of Physical Activity and Late Time-Restricted Eating on Eating Behavior, Cognitive Performance, and Cardiometabolic Health in Overweight and Obese Women

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Résumé

Baground : Obesity is a major risk factor for numerous chronic (1, 2) and neurological diseases(3, 4), leading to the development of various intervention strategies such as dietary adjustments, regular physical activity, and behavioral therapies. Time-restricted eating (TRE) has emerged as a promising approach (5), offering benefits for metabolic regulation and supporting the body's natural circadian rhythms. Additionally, TRE may contribute to better cognitive health (6) by enhancing insulin sensitivity and lowering cardiometabolic risk (7). However, TRE alone may not be sufficient to manage obesity, highlighting the need to incorporate complementary strategies such as regular physical activity to optimize health outcomes.
Objective: The present study aimed to investigate the impact of PA combined with TRE on eating behavior, cognitive performance, and physiological responses in overweight or obese women.

Methods: Forty-six participants were randomized into three groups: Late time-restricted eating with physical activity (LTRE-PA, n = 15, 30.60 ± 7.94 years, 94.45 ± 15.36 kg, 34.37 ± 7.09 kg/m^2), late time-restricted eating (LTRE, n = 15, 27.93 ± 9.79 years, 88.32 ± 10.36 kg, 32.71 ± 5.15 kg/m^2), and a control group (CG, n = 16, 36.25 ± 11.52 years, 89.01 ± 11.68 kg, 33.66 ± 6.18 kg/m^2).

Results: Both LTRE-PA and LTRE groups showed significant reduction in eating disorder global scores and an increase in dietary restriction subscale compared to CG ($p< 0.0005$). The LTRE-PA group exhibited a decrease in weight concern subscale compared to LTRE ($p=0.007$) and CG ($p< 0.0005$) groups. Additionally, only LTRE-PA ($p< 0.0005$) and LTRE ($p< 0.001$) groups enhanced their vigilance in post-intervention compared to pre-intervention. Furthermore, LTRE-PA group showed an improvement in global cognition scores compared

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to both LTRE and CG groups ($p< 0.0005$). LTRE-PA group also experienced a significant reduction in resting heart rate relative to LTRE ($p=0.04$) and CG ($p< 0.0005$) groups. Furthermore, LTRE-PA was associated with an increase in oxygen saturation compared to the LTRE group ($p=0.04$).

Conclusion: The present study demonstrates that the combination of physical activity and time-restricted eating (TRE) leads to substantial improvements in eating behaviors, overall cognitive performance, oxygen saturation and resting heart rate, when compared to fasting alone and the control group. These results align with previous research, suggesting that physical activity, when paired with caloric restriction, acts synergistically to enhance both cardiometabolic health and cognitive function. The observed enhancement in cognitive function, particularly in vigilance, in the LTRE-PA group could be a consequence of synergistic effects of physical exercise on brain function, likely through increased cerebral blood flow and neurotransmitter modulation.

Keywords: time-restricted eating; obesity; cognitive performance; physical performance; eating behavior

(1) Jin, X.; Qiu, T.; Li, L.; Yu, R.; Chen, X.; Li, C.; Proud, C. G.; Jiang, T. Pathophysiology of Obesity and Its Associated Diseases. Acta Pharmaceutica Sinica B 2023, 13 (6), 2403–2424. https://doi.org/10.1016/j.apsb.2023.01.012.

(2) Yang, X.; Hao, X.; Liu, M.; Hu, Y.; Wang, X.; Liu, Y. The Prevalence of Obesity and Relationship between Obesity Indicators and Chronic Diseases in Northern Shaanxi, China. Endokrynologia Polska 2024, 75 (1), 71–82. https://doi.org/10.5603/ep.96227.

(3) Feinkohl, I.; Lachmann, G.; Brockhaus, W.-R.; Borchers, F.; Piper, S. K.; Ottens, T. H.; Nathoe, H. M.; Sauer, A.-M.; Dieleman, J. M.; Radtke, F. M.; van Dijk, D.; Pischon, T.; Spies, C. Association of Obesity, Diabetes and Hypertension with Cognitive Impairment in Older Age. Clin Epidemiol 2018, 10, 853–862. https://doi.org/10.2147/CLEP.S164793.

(4) Tasnim, N.; Khan, N.; Gupta, A.; Neupane, P.; Mehta, A.; Shah, S. A.; Dey, R. C. Exploring the Effects of Adiponectin and Leptin in Correlating Obesity with Cognitive Decline: A Systematic Review. Annals of Medicine and Surgery 2023, 85 (6), 2906. https://doi.org/10.1097/MS9.0000000000000766.

(5) Ismoilov, J. A.; Egamberdiyeva, Y. K. kizi; Mahmamuradova, N. N.; Daminov, A. T. TIME-RESTRICTED NUTRITION AS A NEW STRATEGY FOR THE THERAPY OF OBESITY AND COMORBID CONDITIONS. Educational Research in Universal Sciences 2024, 3 (4 SPECIAL), 660–667.

(6) Li, G.; Hu, Y.; Zhang, W.; Wang, J.; Ji, W.; Manza, P.; Volkow, N. D.; Zhang, Y.; Wang, G.-J. Brain Functional and Structural Magnetic Resonance Imaging of Obesity and Weight Loss Interventions. Mol Psychiatry 2023, 28 (4), 1466–1479. https://doi.org/10.1038/s41380-023-02025-y.

(7) Miladi, S.; Driss, T.; Ameur, R.; Miladi, S. C.; Miladi, S. J.; Najjar, M. F.; Neffati, F.; Hammouda, O. Effectiveness of Early Versus Late Time-Restricted Eating Combined with Physical Activity in Overweight or Obese Women. Nutrients 2025, 17 (1), 169. https://doi.org/10.3390/nu17010169.