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## The role of personality in voluntary exercise behaviors: a Mendelian randomization study

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ABSTRACT: Personality, the individual-level tendencies to show consistent patterns of thoughts and behaviors has long been associated with exercise behavior. The question of causality, however, still remains, as genetic and environmental confounding are difficult to rule out. The use of traditional intervention methods to test causal effects of personality are rather difficult, if not impossible. Here we instead use triangulation across different methods to falsify the causal hypothesis, where failure to falsify across these methods strengthens our confidence in the causal hypothesis. Using a sample from the Netherlands Twin Register (N=39,577) we first establish the cross-sectional and longitudinal associations between the 5 NEO personality traits and exercise phenotypes. Second, controlling for genetic confounding, we assess the regression of monozygotic intrapair differences in both type of traits. Third, twin-sibling structural equation models are used to assess significant correlation of all latent factors influencing personality and exercise. Finally, to test for causality in the presence of genetic pleiotropy, we used the MR-DoC model. Results varied greatly depending on the personality trait and type of exercise. Strongest support for the causal hypothesis was found for the effect of extraversion on total volume of exercise, followed closely by the effects of conscientiousness on total exercise. On the other hand, no support was found for causal effects of neuroticism, agreeableness or openness. These results shed new light on the causality underlying the well-established relationship between personality traits and exercise behavior.