Abstract

Increased phenotypic similarity, or assortative mating (AM), exists between couples compared to random pairs and has been seen across many traits. However, it is currently unclear if these observations are due to active selection of certain phenotypes, post-mating convergence, or a result of confounding factors such as shared environment. Here, we sought to dissect these underlying phenomena using a Mendelian randomisation (MR) approach. We applied MR to a large panel of 118 phenotypes to estimate the direct causal effects impacting mate-choice, explore the impact of time couples live together on their similarity, and to examine the cumulative role of a wide range of potential confounders on trait correlations between partners. Over half (64 of 118) of the tested traits were found to have a causal relationship between partners after adjustment for multiple testing using MR. Another 43 traits showed significant differences between phenotypic correlation and MR-estimates, suggesting the presence of confounders. For instance, systolic blood pressure, basal metabolic rate, weight and height all showed larger phenotypic correlation as compared to MR-estimates. Subsequent analyses revealed many potential confounders which may explain these discrepant observations, such as smoking, overall health rating, household income, and education. Indeed, income and education were found to have a broad confounding impact on trait similarity in couples, explaining 29.8 and 11.6% of phenotypic correlations, respectively. Although, we found limited evidence for couple convergence overtime, couple similarity appears to be stronger through initial selection and confounding factors. Finally, we identified many (1088) cross-trait causal associations among couples which appear to largely be due to AM through one or both traits and a large causal effect between these traits, rather than the presence of indirect genetic effects between couples. In summary, this study has revealed many novel causal effects within couples, and shed light on the impact of confounding on couple phenotypic similarity.