

Smoking moderates the importance of genetic and environmental influences on lung function

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Pulmonary function is an important biomarker for health and aging. Previous studies have demonstrated the influence of both genes and the environment on pulmonary function. Moreover, there is evidence that these influences are moderated by smoking status. However, no study has examined whether there is a dosage effect of smoking on the genetic and environmental influences of pulmonary function. The present study used data from a pooled, cross-sectional, sample of adult twins (age range: 32.8–86.2) from Sweden and the USA (number of pairs = 599). Pulmonary function was indexed by forced expiratory volume at one minute (FEV1), which measures lung volume and is used as an index for respiratory disease. Smoking was indexed by pack years ([cigarettes per day/20] × 9 years smoked). A bivariate moderation model [Purcell, 2000] was used to quantify the degree to which pack years modifies the genetic and environmental influences on pulmonary function. Both FEV1 and pack years were adjusted for sex and age and FEV1 was additionally adjusted for height. Pack years significantly moderated non-shared environmental influences on FEV1; as pack years increased, non-shared environmental influences increased. Heritability of FEV1 for those with pack years = 0 (non-smokers) was $h^2 = 0.67$ while the heritability for those with the highest pack years was $h^2 = 0.24$. Overall, the present study demonstrates that smoking affects the non-shared environmental influences underlying pulmonary function in a “dose-dependent” manner, with a reduction in the heritability of pulmonary function as smoking increases.