

Contribution of gene-by-environment interaction at baseline and change of hand grip strength

Inge Petersen, University of Southern Denmark; Kaare Christensen, University of Southern Denmark; Matthew McGue, University of Minnesota; Chandra Reynolds, University of California Riverside, iGEMS Consortium, Karolinska Institutet

Previous studies have demonstrated that lifespan is positively correlated with baseline as well as decline of hand grip strength. It is well known that males have considerably higher hand grip strength than females but have a steeper decline. Based on studies of twins it has been estimated that the heritability of hand grip strength is approximately 50 %. In the present longitudinal study of a pooled sample of twins from USA, Sweden, and Denmark (N = 10,000; age range: 34–99) with 1–7 repeated grip strength measurements (mean: 2 measurements) we used heterogeneity tests (Fisher 1925) to establish the possible presence of a gene-by-environment interaction as part of the mechanism for baseline level as well as change of hand grip strength. The analyses were based on individual empirical Bayes estimates for intercept and slope retrieved from growth curve modelling. The results of Fishers' heterogeneity test demonstrated evidence of a heterogeneity of within pair differences among monozygotic twins of baseline as well as slope of hand grip in both sexes which may indicate the presence of a gene-by-environment interaction.

Following the heterogeneity tests, we compared the within-pair variances of APOE4 carriers vs. non-carriers in monozygotic twins. Among males, there was a tendency towards a greater within-pair variance of slope and level at age 70 among APOE e4 carriers compared with APOE e4 non-carriers (N = 637 pairs); the reverse pattern was observed among females (N = 401 pairs). However, except for linear decline of females the results were not statistically significant.