**Main outcome measures**

Birth in March 1946.

**Background**

Maintaining high levels of physical capability with age is important given that low levels are associated with increased risk of losing independence, health problems and mortality. Studies of older people provide evidence to suggest that physical activity may be beneficial for the maintenance of physical capability however it is unclear whether the effects of physical activity accumulate over the life course.

**Objectives**

To test the associations between physical activity levels, assessed by self-report of participation in sports and recreational activities prospectively at three ages across adulthood (36, 43 and 53 years), and objective measures of physical capability at age 53 year; to examine whether any associations found are independent of physical activity levels at other ages and other potential confounders.

**Design**

Prospective cohort study.

**Setting**

England, Scotland and Wales.

**Participants**

Approximately 2400 men and women from the MRC National Survey of Health and Development, followed up since birth in March 1946.

**Main outcome measures**

Grip strength, standing balance and chair rise time assessed by nurses during home visits at age 53 year.

**Results**

Physical activity levels at all three ages in adulthood were positively associated with chair rise and standing balance performance. These associations were maintained after adjustment for sex, height, weight and socio-economic position with those people who were categorised as being most active performing better in these two tests than people reporting no activity. In models which included physical activity at all three ages simultaneously, there was evidence of independent positive effects of participation in sports and recreational activities at all three ages on chair rise performance and at ages 43 and 53 years on standing balance performance. Differences in mean chair rise time (1/time(s) × 100) between the most active and least active groups were: (at age 53 year: 0.50 (95% CI 0.14 to 0.46); at ages 36 and 43 year: 0.36 (0.18, 0.54)) after adjustment for activity levels at the other two ages and covariates. There was no evidence of associations between physical activity levels at any age and grip strength in women and in men only physical activity at age 53 year was associated with grip strength. Evidence of independent effects of physical activity at different ages across adulthood on chair rise and standing balance performance in mid-life suggests that there are cumulative benefits of physical activity across adulthood for physical capability in mid-life. Increased activity should therefore be promoted earlier in life.

**Conclusions**

We found that the effect of childhood socio-economic adversity on adult physical activity was entirely mediated by educational attainment. The association between adolescent depression/anxiety and activity was entirely mediated by current mental health problems. These results highlight the importance of education in reducing the adverse effect of childhood socio-economic conditions on adult physical activity. Furthermore, addressing current mental health status should be seen as a priority for policies aimed at physical activity in adulthood.