

# Recent Findings from the SEATTLE LONGITUDINAL STUDY

## A BRIEF HISTORY OF THE SEATTLE LONGITUDINAL STUDY

The Seattle Longitudinal Study (SLS) was begun in 1956 by Dr. K. Warner Schaie in cooperation with the Group Health Cooperative of Puget Sound. The purpose of the research is to study various aspects of psychological development during the adult years. In 1956, five hundred Group Health members participated in the first study. They were randomly selected from the Group Health membership and ranged in age from the early 20s to the late 60s. The study has been continued in seven-year intervals: 1963, 1970, 1977, 1984, and 1991. At each interval all persons who had previously participated in the study were asked to be studied again. In addition at each seven-year interval, a new group of persons randomly selected from the Group Health membership have been asked to participate. Approximately 6,000 adults have participated in the study. Some of these persons who began the study in 1956 have now been participating for almost 40 years. Current participants range in age from 22 to 92 years. In addition to the main study, in 1989-90, data were collected from many adult children as well as sisters and brothers of our main study participants in order to determine the extent of family similarity in mental abilities and some other psychological characteristics.

The Seattle Longitudinal Study is considered to be one of the most extensive psychological studies of how people develop and change throughout adulthood. Dr. Schaie and his colleagues have written over 60 articles and chapters in scientific publications on findings from the study. Numerous newspaper and magazine articles as well as educational television programs have referred to the study. Dr. Schaie has testified before the U.S. Senate Special Committee on Aging regarding findings from the study, and study results have been used as evidence in legal proceedings on age discrimination in employment.

## WHO ARE THE SLS PARTICIPANTS?

Since the study began in 1956, a grand total of 4957 adults have participated in the research. Approximately equal numbers of women (N = 2621) and men (N = 2336) have participated. In the most recent phase of the study occurring in 1990/1992, there were 1810 participants. This included 1117 adults who had been involved in the study previously and 693 new members participating for the first time. In 1989/90 we added 1176 relatives of the participants in the longitudinal study (see Page 2).

The five oldest participants in 1990/92 were 92 years old. As might be expected, the "baby boomers" are well represented in the study with approximately 600 participants. The youngest member in 1990/92 was 22 years old. Are there any "first timers" (those participating in 1956) remaining in the study? Yes! 71 "first timers" continue in the study, with equal numbers of men and women.

## COGNITIVE TRAINING IN OLD AGE

In 1984 we began to conduct cognitive training interventions with older members of the SLS. The purpose was to see whether these adults' performance on the mental abilities of Reasoning and Spatial Orientation could improve as a result of training. All participants in the training study were 65 years of age or older when first trained and had been in the SLS for at least 14 years prior to training.

In 1983/84 we examined the scores of eligible participants and classified them as having remained stable or having reliably decline across the previous 14 years on the abilities of Spatial Orientation and Reasoning. Participants then took part in five training sessions conducted in their home. Results of the 1983/84 training study indicated that two-thirds of participants benefitted significantly from training. Of those who had reliably declined, approximately 40% could be returned to the level of ability they had held 14 years previously.

In 1990/91 we conducted a second phase of the training study to answer three additional questions. First we wanted to know whether the cognitive training in 1983/84 provided benefits that lasted over extended periods of time. Training participants were reassessed in 1990/91. There was substantial maintenance of function on the trained ability, even after a seven-year interval. This effect was most pronounced for those participants who had been classified as decliners for purposes of the initial training.

Second, we wanted to know whether it was possible to use booster training to reverse further losses that occur as study participants move into advanced old age. Participants first trained in 1983/84 were given booster training in 1990/91. Significant improvement resulted from the booster training for both training conditions. The average magnitude of improvement due to booster training was somewhat smaller than the improvement from the original training; but note that all participants who received booster training were now seven years older.

Third, we wanted to know whether we could replicate our training results with a new group of elderly. In 1990/91 a new group of 180 participants received training for the first time. Training improvement was again demonstrated

for this new group of trainees, thus, replicating our 1983/84 findings.

## FAMILY SIMILARITY IN MENTAL ABILITIES

In 1989 a new component of the Seattle Longitudinal Study was begun. Its primary purpose was to study the similarity in mental abilities and some other psychological characteristics among adult family members. Similarity in mental ability performance has been known to exist for parents and their young children, perhaps because they live in the same environment. If similarities persist when family members become adults and strike out on their own, then it would be more likely that family similarity in abilities might in part be inherited. This study examined whether family similarity in mental abilities is found not only at early ages but is maintained throughout adult life.

Participants in the Seattle Longitudinal Study were asked to provide names and address of their adult children and of their brothers and sisters. These family members were contacted and invited to participate in the Family Similarity Study. A total of 1176 persons who were children or sisters/brothers of SLS study participants took part in the Family Similarity Study. This included 776 adult children (465 daughters and 311 sons), and 400 siblings (248 sisters and 152 brothers). These family members took the same tests that had been given to SLS study participants.

We found substantial family similarity for virtually all mental abilities and measures of flexibility, both for parents and their adult children, and for brothers and sisters. The proportion of ability shared between parents and adult children or between siblings was, on average, about 25%. The two exceptions to this findings were for the attitude measure of Social Responsibility and for a measure of perceptual speed; neither of these seems to display inherited characteristics. These findings are similar to previous research examining similarity in mental ability between parents and young children.

A follow-up of members of the Family Similarity Study is now in progress in order to determine how the abilities of family members *change* over time, as compared to how their parents' and/or siblings' abilities have changed. We are also adding relatives who have not previously been included in the study.

## ADULTS' PERCEPTIONS OF THEIR MENTAL ABILITY

A major aim of the Seattle Study has been the objective assessment of adults' mental abilities by means of test performance; by studying the same individuals over many years, change in mental ability performance was assessed. When participants come to take the tests, they often tell us how they think they are doing - whether they believe they are doing as well, better, or more poorly than when they took the tests seven years previously. Participants' own beliefs or perceptions of their mental ability functioning is known as subjective assessment. Studying the relationship between adults' subjective assessment and the objective assessment of mental abilities has become a topic of much interest in adult development and aging, for several reasons. It would be useful to know how accurate adults' are in their beliefs or perceptions about their mental abilities. Can adults' judge when they have improved or declined in mental ability? Are adults' subjective assessments better for some abilities (e.g., verbal ability) than for other abilities (e.g., number)? Are men or women, or younger or older adults more accurate in judging change in mental ability?

In the 1984 phase of the SLS, we began to study subjective as well as objective assessment of mental abilities. Participants were asked to rate whether they thought their current ability performance was the same, worse, or better than their performance seven years previously. Participants were asked to make these ratings after taking each of five different types of ability tests (verbal, number, reasoning, spatial orientation, and word fluency). Since objective test scores on these abilities were also available at each SLS study phase, it was possible to examine the relationship between subjective and objective assessment, and to study accuracy of subjective assessment.

Perceptions of change in mental ability. The majority of participants thought that their mental abilities had remained *stable* over the previous seven years. Verbal ability was the ability thought to have remained most stable; 70% of participants judged no change in their vocabulary test performance. In contrast, only half of all subjects perceived their spatial orientation ability to have remained stable.

Approximately 13-20% of participants judged that their mental abilities had *improved*. Reasoning ability was perceived to have improved by 22% of the group, whereas only 13% rated themselves as having improved in spatial orientation. The largest differences among abilities occurred for judgments of decline. Only 8% of participants felt they had *declined* on Verbal ability, whereas almost 40% believed they were performing more poorly on tests of spatial orientation than they had seven years ago.

Differences in perceptions by age and gender. Do young and older adults differ in their perceptions of change in ability? Do the perceptions of men and women differ? More *young* adults rated themselves to have improved on verbal ability and on reasoning ability, than did older adults. In contrast, more *older* adults rated themselves as having remained stable or improved on number ability, compared with younger adults.

Interestingly, there were few differences in perceptions between men and women, when age of the adult was taken into account. The only significant gender difference in perceptions was for spatial orientation ability. The proportion of men and women who judged themselves to have improved on spatial ability did not differ, but a greater proportion of women than men rated themselves as having declined.

Accuracy in perceptions. How accurate were participants in their perceptions of whether their mental ability performance had changed? To study this question, we categorized participants into three groups. Realists were those who were accurate in their judgments. There was agreement between their test scores and perceptions. For example, they rate themselves as having declined and their test scores actually did decline; or they perceived themselves to be stable and indeed their test scores had not changed reliably. Optimists were those who thought they were doing better than their test scores indicated. They thought they had improved when their test scores showed no change or decline. Pessimists rated themselves more negatively than their test scores indicated. They thought they had remained stable when their test scores had improved; or they thought they had declined when there was no change in their test scores. Approximately half of the participants were

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## THE SLS HEALTH BEHAVIOR SURVEY

In 1993 all SLS participants were contacted by mail and asked to complete the Health Behavior Questionnaire. All participants who had taken part in the 1989-91 wave of the SLS were sent a questionnaire. Approximately 83 percent of participants (a total of 2491 persons) responded -- an excellent response rate! The questionnaire focused on eight domains of health behaviors which are described below:

**Smoking Behavior** Questions focused on current and prior smoking behavior. If a participant smoked, he/she was asked whether they had quit or attempted to quit smoking, when they quit smoking, how much they smoked, and what form of tobacco was used.

**Alcohol Consumption** Participants were asked whether they drank, how much they drank, how frequently they drank, and what forms of alcohol were used (e.g., beer, wine).

**Unhealthy Foods** Eating habits related to foods considered to be primary sources of fat or cholesterol were studied. Participants were asked how frequently they ate certain types of meat (e.g. organ meat, beef) and dairy products, such as egg yolks.

**Food Preparation** Participants were asked whether they read the nutritional information on food labels regarding fat or sodium, whether they bought foods low in sodium or fat, and whether they prepared foods taking into account sodium and fat.

**Exercise** Questions focused on how many times during a week one participated in exercise and how much time was spent in exercise activities.

**Seat Belts** Participants answered questions regarding how regularly they used seat belts both in town and on the highway.

**Dental Care** Dental habits were examined, including frequency of dental visits, teeth brushing, flossing, and denture cleaning.

**Medical Checkups** Participants were asked to report on how regularly they carried out routine medical exams. These checkups

### NEW BOOK ON SLS PUBLISHED BY CAMBRIDGE UNIVERSITY PRESS

Some of you may be interested in the technical details of the SLS, a full account of its 35-year history, as well as a comprehensive discussion of its many findings and their implications. All this material is becoming available in a book entitled **Adult Intellectual Development: The Seattle Longitudinal Study**, authored by Dr. K. Warner Schaie and published by Cambridge University Press of New York in January 1996. The book can be ordered through most university book stores.

included vision and hearing exams, cholesterol and colon/rectal exams, flu shots, and general physical checkups.

In addition to questions regarding health behaviors, we also asked participants about their health status. Two types of questions were asked. One type of question focused on frequency of contacts with health professionals -- number of doctor visits in the past year, days in the hospital, etc. The other type of question dealt with the participants own feelings or perception of their health. Participants were asked to rate their health compared to other people their age and to indicate whether they thought their health had changed (for the better or worse) in the past few years.

### ADULTS' PERCEPTIONS OF THEIR MENTAL ABILITIES

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*realistic* in their judgments of change or stability in their abilities. Participants were most accurate (realistic) in estimating stability or change in Verbal ability. Approximately 30% of participants were *optimists*, judging themselves to have improved or remained stable, when test scores indicated stability or decline. The proportion of *pessimists* varied across abilities. Approximately 33% of participants were pessimists with respect to spatial ability, but only 10% were pessimists with respect to Verbal ability.

## AGING AND HEALTHFUL LIFE STYLES

Who is most likely to carry out health behaviors -- young, middle aged, or older adults? More older adults reported regularly performing health behaviors than young or middle aged adults. Other major health surveys have reported similar findings.

One of the happy findings of our survey is that relatively few SLS participants smoke. There are, however, age differences. Older adults were least likely to be current smokers -- about 5 percent of older adults said they currently smoked, compared to about 12 percent of young and middle aged adults. However, a greater proportion of older adults (than young or middle aged adults) reported having smoked in the past. Approximately 45 percent of older adults reported never smoking.

The relationship between alcohol use and age is quite complex. At all ages (young, middle and old age), there is a large proportion of adults who report never drinking or having drinks only a few times a year -- approximately 40 percent of young and middle age adults and 53 percent of older adults. On the other hand, approximately 15-17 percent of young, middle aged and older adults 65-74 years of age report having drinks two or more times a week. Fewer adults over the age of 75 report drinking several times a week. The remaining group of adults drink a few times a month. At all ages, almost twice as many men as women report having drinks two or more times a week.

One of the surprising findings was that older adults, particularly older men, reported spending more time in exercise than younger adults. The amount of time spent in exercise in an average week increased from young to middle to old age. The most active group was the young-old, those 65-74 years of age.

Older adults were also more likely to read nutritional information on food labels regarding sodium and fat content. A larger proportion of the elderly reported buying foods low in fat and sodium. Older adults ate less meat and dairy products high in cholesterol and fat.

Routine medical checkups were more common among the elderly -- including flu

shots, cholesterol and colon/rectal exams, general physical exams, and hearing and vision checkups.

There are many possible explanations for why older adults are more likely to engage in various health behaviors. Unfortunately we did not ask in our survey why the participant carried out a particular health behavior. It may be that the elderly realize they are more vulnerable to health problems and thus engage in more preventive activities. On the other hand, some older adults may be engaging in certain health behaviors in response to chronic diseases -- for example, exercise and dietary behaviors are carried out in response to cardiovascular health problems. Given that the elderly report more visits to health personnel, some routine health checkups (e.g., blood pressure exam, mammography) may be a spillover of visits initiated for other reasons. The physician suggests a routine checkup in conjunction with a visit for a particular health problem. The good news is that a majority of SLS participants are engaging in healthful life styles and avoiding at risk behaviors -- and older adults are leading the way!

## ARE WOMEN "HEALTHIER" THAN MEN?

One of the interesting, but puzzling findings from our survey deals with gender and health. Women at all ages report seeing a physician more frequently in the past 12 months than do men; more women than men also report having been in the hospital in the past year. However, men and women do not differ significantly in their ratings of their overall health. Seventy-three percent of men and women reported their health to be very good or good, compared to other people their age. More women report that their vision has declined over the past few years, while more men report a decline in hearing.

Women report more regularly engaging in most of the health behaviors that we studied than do men. Fewer women say they currently smoke than men, and 57 percent of women report never smoking. More younger women smoke than older women. Men, who smoke, also report smoking more cigarettes per day.

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**ARE WOMEN "HEALTHIER" THAN MEN?**

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The good news is that relatively few SLS participants, men or women, are current smokers -- 11 percent of men and 8 percent of women!

Another good finding is that most SLS participants are quite moderate in their consumption of alcohol. On average, men reported drinking 1.7 glasses of wine in the past week, compared to 1.3 glasses for women. Men, on average, drank 1.6 bottles of beer, with women reporting less than one bottle. However, there are wide individual differences in use of alcohol. Ten percent of men and thirteen percent of women report never drinking in the past year, while 20 percent of men and 11 percent of women report some use of alcohol daily.

Exercise is the one health behavior domain in which men are more active than women. Men report exercising more hours per week and more times per week than do women.

With regard to dental care, women indicate that they clean their teeth (or dentures) more frequently than do men. However, there are no gender differences in having a regular dental checkup; over 50 percent of men and women report visiting a dentist in the past year.

A significantly greater proportion of women say that they ALWAYS use a seat belt when driving or riding in town and on the highway. When the difference between men and women is statistically significant, it is reassuring that over 80 percent of men and women report wearing a seat belt regularly!

One possible reason for why women report more physician visits during a year is that they are more likely to have regular health-related medical checkups than men. A greater proportion of women report having regular physical checkups and having colon/rectal exams. Women report having their blood pressure taken more frequently by medical personnel, again this finding may be related to having more contact with the medical establishment. Interestingly, men are somewhat more likely than women to take their own blood pressure, rather than depending on medical personnel.

Other studies have found similar findings regarding gender differences in health behaviors. There is, however, considerable debate over the reasons why women are more likely to carry out health behaviors, but also report more hospital and physician visits. One possibility is that women are more sensitive to their bodies and to health-related issues, perhaps associated with years of being a mother and serving as the caregiver in a family. Alternatively, there may be differences in health care for men and women; different treatments and medical routines may be recommended by health personnel for men and women.

**RECENT SLS PUBLICATIONS IN THE SCIENTIFIC LITERATURE**

Gruber-Baldini, A. L., Schaie, K. W., & Willis, S. L. (1995). Similarity in married couples: A longitudinal study of mental abilities and flexibility-rigidity. *Journal of Personality and Social Psychology: Personality Processes and Individual Differences*, 69, 191-203.

Schaie, K. W. (1994). The course of adult intellectual development. *American Psychologist*, 49, 304-314.

Schaie, K. W., & Willis, S. L. (1995). Perceived family environments across generations. In V. L. Bengtson, K. W. Schaie, L. M. Burton (Eds.), *Adult intergenerational relations: Effects of societal change* (pp. 174-209). New York: Springer.

Schaie, K. W., Willis, S. L., & O'Hanlon, A. M. (1994). Perceived intellectual performance change over seven years. *Journal of Gerontology: Psychological Sciences*, 49, P108-P118.

Willis, S. L., & Schaie, K. W. (1994). Cognitive training in the normal elderly. In F. Forette, Y. Christen & F. Boller (Eds). *Plasticité cérébrale et stimulation cognitive* [Cerebral plasticity and cognitive stimulation] (pp. 91-113). Paris, France: Fondation Nationale de Gérontologie.

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