OBSERVATIONS FROM THE SEATTLE LONGITUDINAL STUDY OF ADULT INTELLIGENCE

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I was 28 years old in 1956 when I first surveyed 500 members of a Seattle-area HMO for my doctoral dissertation at the University of Washington. I had no idea when I started the Seattle Longitudinal Study of Adult Intelligence that I would be quizzing many of those same people about their cognitive abilities almost a half century later.

Q. What is the Seattle Longitudinal Study of Adult Intelligence?

A. The Seattle Longitudinal Study (SLS) is considered one of the most extensive psychological research studies of how people develop and change through adulthood. In 1956, five hundred people, ranging in age from their early 20s to late 60s, were randomly selected to participate in the first study. The study has continued in seven-year intervals since 1956: 1963, 1970, 1977, 1984, 1991, and 1998. At each interval, all persons who had previously participated in the study were asked to participate again. In addition, at each seven-year interval, a new group of people has been asked to participate.

Approximately 6,000 people have now participated in this study. Of the original participants, more than three dozen remain who have now been in the study for 48 years. Current participants range in age from 22 to 101 years. In addition to the main study, we collected data in 1989/90 from many adult children as well as siblings of our main study participants in order to determine the extent of family similarity in mental abilities and other psychological characteristics. Many of these relatives were studied again in 1996/97 and in 2003/04. In 2002, grandchildren of our main study group also began to participate, making SLS the first three-generation study of cognitive abilities ever conducted in this country.

Q. What are the goals of the Seattle Longitudinal Study?

A. Throughout the history of the SLS our focus has been on several key questions, which we have attempted to ask with greater clarity at each successive stage of the study:

• Does intelligence change uniformly through adulthood or are there different life-course ability patterns? Our studies have shown that there is no uniform pattern of age-related changes across all intellectual abilities. Our data do lend some support to the notion that abilities that are primarily genetically determined tend to decline earlier than abilities that are primarily acquired through schooling or experience.

• What accounts for individual differences in age-related changes in adulthood? The variables that have been implicated in reducing risk of cognitive decline in old age have included (a) absence of cardiovascular and other chronic diseases; (b) a favorable environment mediated by high socioeconomic status; (c) involvement in a complex and intellectually stimulating environment; (d) flexible personality style at midlife; (e) high cognitive status of spouse; and (f) maintenance of high levels of perceptual processing speed.

• Can intellectual decline with increasing age be reversed by educational intervention? Findings from the cognitive training studies conducted with our longitudinal subjects suggest that observed decline in many assisted-living, retirement community-dwelling, and nursing home residents might well be a function of disuse and is clearly reversible for many. Indeed, cognitive training resulted in approximately two thirds of the experimental subjects showing significant improvement; about 40 percent of those who had declined significantly over 14 years were returned to their pre-decline level.

Q. Has this study unearthed things that you weren't looking for when you designed the study?

A. This study has provided information that we weren't looking for when we first started. For example, when I started the study nobody knew much about Alzheimer's disease. We are now able to go back in the records of our study subjects and attempt to figure out at what point we could have made the judgment that they were at risk for Alzheimer's. In some cases, it turns out that we can identify people as long as 25 years before they were actually diagnosed with AD.

Q. What general observations have you made in your research about age, the mind, and cognition?

A. Well, the first thing that we note is that when we study individuals over time they tend to gain in abilities right into early mid-life. They remain fairly stable until their 60s or so. There seems to be a decline after that. It's more complicated than that, however. Even in mid-life, there are some people who still gain in abilities while there are others who start declining.

We are interested in trying to identify the distinguishing characteristics of these people. We've looked at education, occupational status, and personality characteristics. We've also investigated the impact of being married to someone who is smarter than you are.

We've recently also begun to look at the influences of chronic diseases. For example, what difference does it make whether you have hypertension or not? What difference does it make if you have diabetes or arthritis? We've been trying to identify those influences that distinguish different cognitive paths.

Q. Do people get better at certain things as they age?

A. Since we use language every day and have a lot of practice with it, we have found that people do get better with language skills. Most people tend to increase their word skills until their early 60s at least.

Developing and maintaining other abilities depends pretty much on whether a person has an opportunity to exercise them. Spatial orientation is an example. Spatial abilities include such things as being able to look at a map and determine which way to go, or how to assemble furniture that comes in pieces. For men, these skills hold up into their 80s, while they decline very rapidly for women as they age.

If you have the appropriate occupational opportunity, your abilities may remain at high levels or increase right into mid-life. For many other people, however, some mental abilities start going down in early mid-life simply because they don't get used as much.

From our tests, we see that women generally have a lifelong advantage in verbal comprehension (recognizing vocabulary), verbal memory (recalling word lists), and word fluency (developing lists of words that start with a certain letter).

Q. How can we improve our chances of keeping our minds intact as we age?

A. One of the most compelling findings is related to the fact that if you start out at a very high level of mental functioning, which is generally associated with a high level of education, you can afford to drop quite a bit before it makes a difference to your life. A well-functioning 75-year-old might describe himself as a shadow of his former mental self. Nonetheless, it's still a very respectable shadow.

Compare these people to those who start at a much lower level of cognition, with little education and a history of menial jobs throughout their lives. They will drop much earlier below the threshold that's necessary for independent functioning.

Q. Does education level make a significant difference in cognitive health as one ages?

A. Yes. That's because your level of education has all sorts of other influences. For example, it's education that makes it more likely that you're going to maintain a healthy lifestyle, that you will exercise regularly, and that you're going to see a physician at the first appearance of any unusual symptoms. Again, education will determine whether you will work with your doctor in managing any chronic disease you might develop. Then, too, your higher education may help you get a better job. When you are economically advantaged you can obtain better services than if you're not.

To maintain high levels of cognition, you need to have mental stimulation throughout your life. Older people with good support systems have more opportunities for stimulating activities. By contrast, people who live alone, who don't have family or many friends, typically lack these kinds of supports. The smaller your support system, the less likely you are to take part in stimulating activities, such as going to the theater or movies.

Q. Are problems with cognition more prevalent in men than in women?

A. It seems like cognition problems occur earlier in men than in women, but of course we always have to recognize that men, on average, are always about five years or so closer to death than are women of the same age. Therefore, it's not surprising that at the same age, you find a larger proportion of men having some difficulty with cognition.

Q. Do cognition problems develop at a certain age?

A. It's simply not normal for people to show real difficulty before the age of 60. If they do have problems at this time, it means something is going on. They may be genetically disadvantaged so they are beginning to show earlier decline, or else they have some neuropathology beginning in their brain.

Beginning in their early 60s, a larger proportion of people begin to experience some mild difficulties with cognition. I want to point out that this is not universal. There are plenty of 80-year-olds who have no problems at all with cognition.

Of course, you have to remember that when people reach their 70s, more of them are in fact close to their own demise. There are all sorts of things that start to go wrong medically when you get on your individual trajectory—I sometimes call it your "death trajectory." This all starts with the appearance of minor ailments and then it starts cascading from there.

Medications are taken by older people for a host of medical problems and these prescription drugs may play a role in cognition problems. There hasn't been a medication invented yet that has no side effects. And some of those do affect the brain, even if only in a very mild manner.

Q. What ailments affect the brain and cognition the most?

A. The big two are really heart disease and hypertension. I find that people who have problems with hypertension early in life are among the ones who show very early cognitive decline. In addition, diabetes, which some experts think is really just one component of heart disease in general, also causes cognition problems because it's associated with unfavorable lifestyle changes.

Another factor we have identified as being important in affecting cognition is osteoarthritis. Arthritis indirectly affects cognition through unfavorable changes to lifestyle. That is, the ailment affects mobility and limits things that people can do in their daily lives.

The way we maintain our cognitive skill is by incessant stimulation, and the less stimulation we get, for whatever reason, the greater the adverse effects. That's why it is so important to maintain mobility for as long as possible.

Q. What has been the impact of alcohol on people in the SLS?

A. There are not many alcoholics who participate in long-term studies. For those who do drink, we have found that it's best to be a very moderate social drinker.

Q. What about the impact of smoking on cognition?

A. The number of smokers in our study was very small. Tobacco use is a major health problem that affects all organs, including the brain.

Q. What are the generational differences that you've noticed since you began the study?

A. We have seen a dramatic increase in some abilities across successive samples at the same ages. There are some tantalizing findings that suggest that the rate of aging from the point where people start going down physically and mentally has slowed somewhat. This has important implications because in all western societies the pension systems will start going broke unless we can have people work for more years. In addition, our find-

ings suggest that this may very well be possible, especially since fewer and fewer people are indeed working in physically strenuous occupational activities.

In the United States, there has been an increase of about five years of education since we started the study. The younger generation is far better educated than their parents. We also find that the younger generation in general tends to have somewhat healthier lifestyles than their parents had at the same age. There has also been a tremendous shift in the occupational range. In the parents' generation, we have a significant number of people who spent their lives either in farming or manufacturing jobs. The majority of their children, however, are in sales, clerical work, or professional occupations.

Q. What role does a spouse play in enhancing cognition?

A. The evidence is quite clear that it's probably smart to marry someone who is smarter than you are. Our long-term data suggest that a spouse who is the lower-functioning partner benefits from living with the higher-functioning spouse because his or her brain is constantly stimulated in order to coexist with the partner.

One of the interesting things we found from the approximately 150 married couples in our study was that their abilities converged over time. It seems that the longer a couple is together, the more the lower-functioning spouse moves in the direction of the higher-functioning partner.

Just as one has to exercise one's muscles to keep them from going flabby, one also has to stimulate one's brain. The likelihood of stimulating your brain is so much greater when you have constant conversation partners. If you are a widow or widower but have a large circle of friends, the strong social ties help in maintaining cognitive functions.

Q. Is retirement a good idea?

A. Well, it's a two-sided coin. Retirement is probably good for people who had stressful jobs. Anything less stressful might be better for them. The same goes for people who had unfulfilling, uninteresting jobs. We have some data showing that people who work at routine jobs actually thrive in retirement. Contrast this to people who have had very challenging and stimulating jobs. These people often don't do as well in retirement because they have not found something to replace the stimulation offered by their previous work. Would sealing envelopes for the March of Dimes be a good replacement for their challenging careers? Probably not.

It turns out that people who have very challenging jobs do better if they keep on work-

ing as long as possible, because it is very difficult for them to replace the challenge of their job in retirement.

On the other hand, people who have engaged in very routine jobs during their work lives seem to do better in retirement because they can engage in more interesting pursuits than were available as part of their jobs. In the future, this means that we may end up with different retirement ages for different occupational groups.

Q. Should people plan for a transition period from work to retirement?

A. If you are going to have a good retirement, you are going to have to learn how to retire. Many people formally retire from their jobs but promptly go back to work on some other job because they get bored in retirement. It's very important that you don't just say, "OK, I'm going to retire next year." You really need to figure out what you are going to do in the upcoming years.

Q. Based on your findings, what do you think are the broader implications from the SLS about the way we take care of our older citizens?

A. It's very clear that there is no reason to assume that people necessarily decline to the level where they can't function independently until relatively close to their final illness. What this means is that we have to provide many more meaningful opportunities for older persons. One of the problems with many voluntary activities is that people who have had responsible positions in their work life are asked to stuff envelopes, and that's not enough to keep their minds vital and active.

Q. Is there truth in the old expression, "use it or lose it?"

A. Absolutely. There's nothing worse than being a couch potato and spending your time in front of the television. As you begin to stop making decisions, it won't be long before you have difficulty actually making decisions. The notion that you can no longer do anything becomes a self-fulfilling prophecy. However, many older people who have very mentally and physically active lives maintain high levels of cognition up to their final illness.

Q. Are there specific activities that are effective for enhancing cognition?

A. Different activities may serve different functions. For example, doing a crossword puzzle a day is likely to help maintain your verbal ability. On the other hand, if you are interested in doing something about your spatial ability you might be better off doing

jigsaw puzzles or playing pool or billiards. Others will benefit from square dancing, where you are required to follow the caller and make intricate movements, which again involve both spatial orientation and problem solving.

When people ask me for advice about protecting their brains, I usually recommend that they do the things they enjoy. If you don't enjoy whatever it is you're doing, you'll soon stop doing it.

Q. Have the good lifestyle habits of your study participants guided you in your own health habits?

A. The evidence is very clear that there are some lifestyle changes you must make if you want to live a healthy, long life and maintain cognition. Through daily calorie restriction and daily exercise, I have tried to reduce my weight and have been successful. I am back to now what I weighed in my 40s. It was difficult to achieve, but well worthwhile.