

## INFLUENCE OF AGE ON INTELLECTUAL DECLINE AMONG ADULTS.

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### Abstract

*This paper examined the influence of age on intellectual decline among adults. It explored literature which establishes that cognitive abilities are very strong in early adulthood and that intelligence begins building up in adolescence, reaches apogee in middle adulthood and begins to decline in late adulthood. The concept of fluid and crystallized intelligence, the Seattle longitudinal study, cohort effects and information processing were reviewed to understand how intellectual functions change or decline across ages while others increase as long as the individual remains in an intellectually stimulating environment. Based on the finding, it was recommended that, task performance or assignment should be age dependent. Good nutrition and physical exercise are needed for the brain to develop and function properly. Adequate sleep and rest to recharge the brain for proper functioning are recommended also.*

**Key words:** Age, fluid, and crystallized intelligence, Seattle longitudinal study and cohort effect.

## **INTRODUCTION**

There has been much debate among psychologists such as Wechsler (1972), Horn & Donaldson (1980) whether there is intellectual decline with age or not. The recent trends believe that intelligence decline with age because of several factors. Age according to the American Heritage Student Dictionary, (1994) is defined as the length of time during which a person or thing has existed. Intelligence on the other hand is viewed as the capacity to gain and use knowledge and mental abilities. Some researchers such as (Salthouse 1991) emphasize the capacity for abstract thinking. Others like Jensen (1999) focus on the ability to acquire new knowledge still others (Sternberg & Detterman 1986) highlight the ability to adopt to new situations, even experts disagree on exactly how intelligence should be defined (Sternberg & Detterman, 1986).

Even though experts plainly disagree about the definition of intelligence there is a reasonable consensus on the sorts of tasks that require intelligence. Binet (1911) believed that intelligence was a general attribute that manifested itself in the sphere of cognitive functioning. This belief led to construction of the test that included many subtasks varying in both content and difficulty such as copying a drawing, repeating a string of digit, understanding a story, and so on. Their understanding was that a person might do well on one or two by virtue of luck or specific experience, but only a truly intelligent person would be able to do well on all the tasks. As Binet (1911) puts it “it matters very little what the tests are so long as they are numerous.

### **Age and Intelligence Decline**

There is a telling decline in many physical characteristics in middle adulthood. People in this category might not run as fast, see as well or be as healthy as in their twenties and thirties. But cognitively, studies of (Piaget 1952, Horn & Donaldson 1980) have shown that, cognitive abilities are very strong in early adulthood. Some developmentalist (Baltes, 1993, 1996) believe that at early adult hood many individuals consolidate their formal operational thinking. That is, they may begin to plan and hypothesize about intellectual problems in adolescence but they become more systematic and sophisticated at this, as young adults. Nonetheless, many adults do not think in informal operational ways at all (Keating 1980).

Researchers have found that young adults are more likely to engage in post formal thinking than adolescents (Commons, Sinnott, Richards & Armon 1989). A related perspective on adult cognitive change was proposed by Schaie and Willis

(2000). They concluded that adults go beyond the powerful methods of scientific thinking that is characteristic of the formal operational stage. However, Schaie (1996) argued that adults do progress beyond adolescents in their use of intellect. For example, we often switch from acquiring knowledge to applying knowledge. This especially occurs as individuals pursue long term career goals and attempt to achieve success in their work.

Having established that cognitive abilities are strong in early adulthood, to understand how intellectual function changes across age, the explanation will focus on the concept of fluid and crystallized intelligence, the Seattle longitudinal study, cohort effects and information processing.

### **Fluid and Crystallized Intelligence**

According to Cattell, (1941), fluid intelligence refers to the ability to deal with new and unusual problems; an ability heavily influenced by mental speed and flexibility. Crystallized intelligence on the other hand refers to the individual's repertoire of previously acquired skills and information, a repertoire that is useful for dealing with familiar problems or problems similar to those already encountered (Horn 1985).

Horn and Donaldson (1980) believe that some abilities begin to decline in middle age while others increase. They argued that crystallized intelligence, an individual's accumulated information and verbal skills continue to increase in middle adulthood or with age so long as the individual remains in an intellectually stimulating environment. While fluid intelligence, one's ability to reason abstractly reaches its height in early adulthood begins to decline in the middle adulthood years. Further, (Sternberg, Gregorenko & Oh, 2001) confirmed that some abilities such as speed of mental processes and abstract reasoning may decline in later years but aspects of practical and integrative thinking tend to improve throughout most of adult life (Sternberg, Gregorenko & Oh, 2001).

### **The Seattle Longitudinal Study**

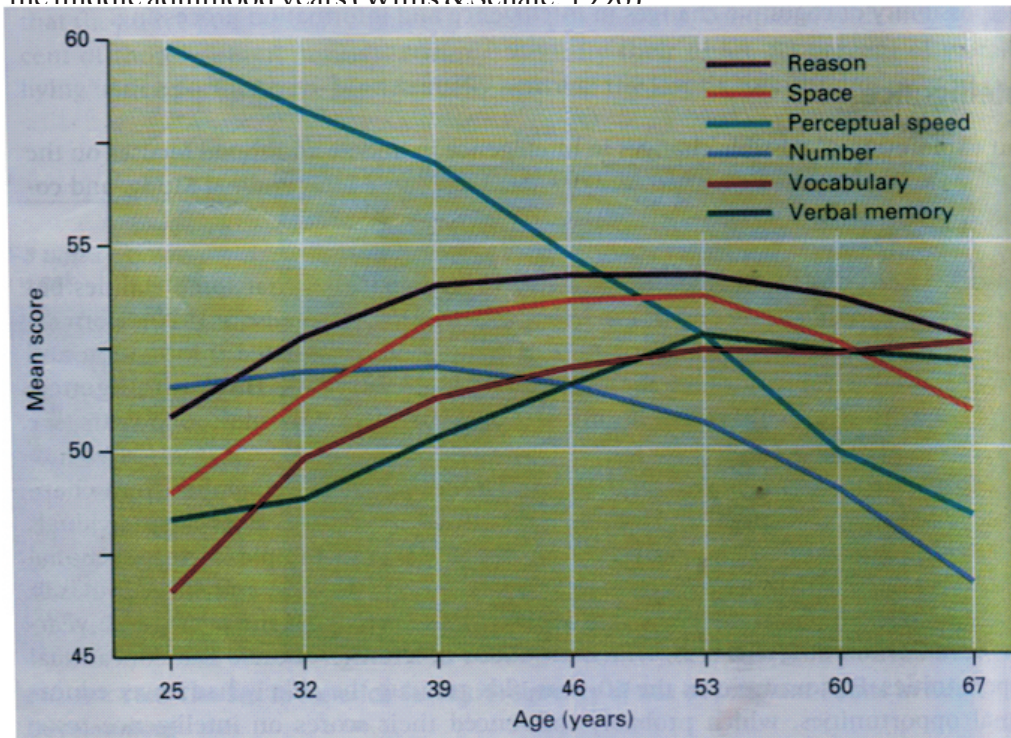
This was an extensive study of intellectual abilities in the adulthood years by Schaie (1996). Five hundred individuals initially were tested and new waves of participants added periodically. Researchers measured six primary mental abilities.

- i. Vocabulary (ability to understand ideas expressed in words).
- ii. Verbal memory (ability to encode and recall meaningful language units, such as list of words).

- iii. Number (ability to perform simple mathematical computation such as addition, subtraction and multiplication).
- iv. Spatial orientation (ability to visualize and mentally rotate stimuli in two- and three dimensional space).
- v. Inductive reasoning (ability to recognize and understand patterns and relationship in a problem and use this understanding to solve other instances of the problem).
- vi. Perceptual speed (ability to quickly and accurately make simple discriminations in visual stimuli).

Below in fig 1.2.

Is the highest level of functioning for four of the six intellectual abilities occurs in the middle adulthood years (Willis & Schaie 1996)



**Fig 1.2** Longitudinal change in six intellectual abilities from age 25 to age 67.

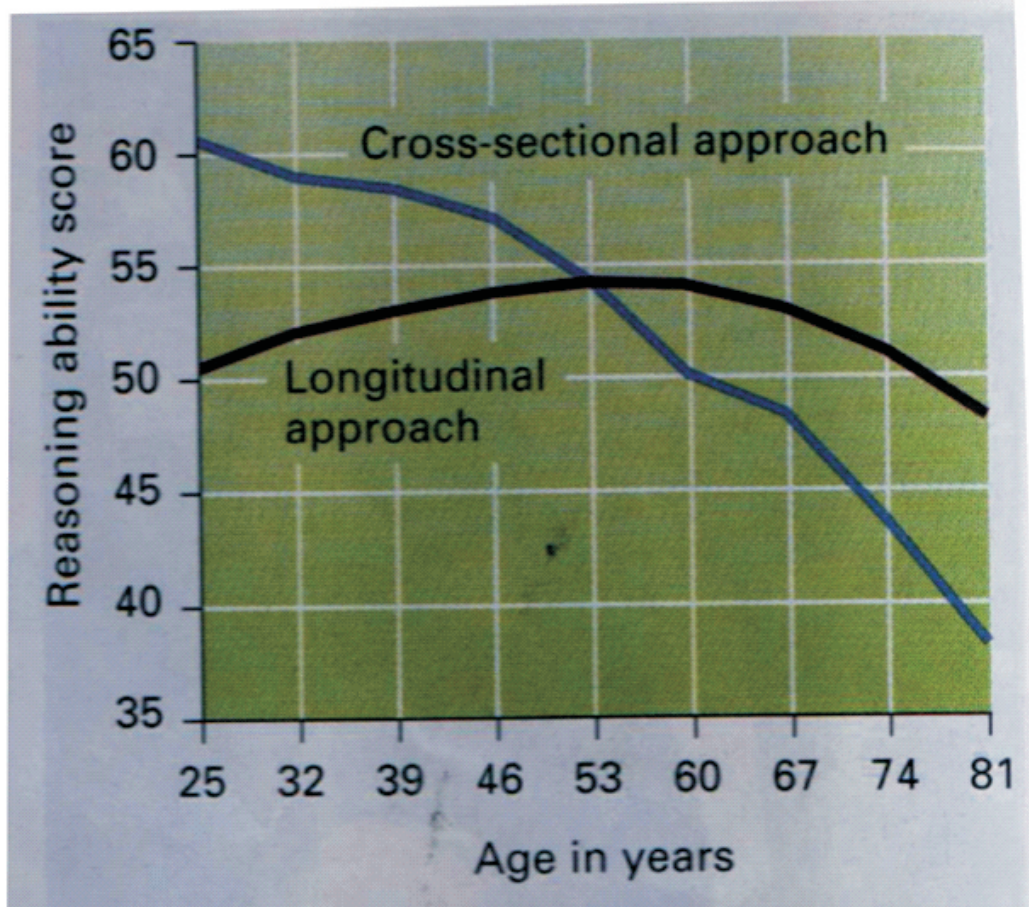
*Source: Schaie 1996 Seattle Longitudinal Study*

For both women and men, peak performance on vocabulary, verbal memory, inductive reasoning, and spatial orientation was attained in middle age. Only two



out of the six abilities, for instance, numerical ability and perceptual speed showed declines in middle age. Perceptual speed showed the earliest decline beginning in early adulthood.

When Schaie(1996) assessed intellectual abilities both cross-sectionally and longitudinally, he found decline more likely in the cross-sectional than in the longitudinal assessments. As shown in fig 1.3 when assessed longitudinally inductive reason increased until towards the end of middle adulthood, when it



**Fig 1.3** Cross-sectional and longitudinal comparisons of intellectual change in middle adulthood.

*Source: Schaie 1996 Seattle Longitudinal Study*

By contrast, when assessed cross-sectionally inductive reasoning showed consistent decline in the middle adulthood years.

It is interesting to note that Horn and Donaldson's (1980) idea that was discussed earlier that middle age was a time of peak performance for both some aspects of crystallized intelligence (vocabulary) and fluid intelligence (spatial orientation & inductive reasoning) correlates with that of the participants in Seattle Longitudinal Study. Thus, for Schaie (1996), it is in middle adulthood, not early adulthood that people reach a peak in their cognitive functioning for many intellectual skills.

### **Cohorts Effects and intelligence change**

According to data obtained cross-sectionally involving assessment of individuals of different age at the same point in time, Horns (1980) revealed that the average 40 year old and 60 year olds were born in different eras, which produced different economic and educational opportunities. For instance as the 60 years old grew up, they likely had fewer educational opportunities, which probably influenced their scores in intelligence tests. Therefore, if there are differences between 40 and 60 year olds on intelligence test when they are assessed cross-sectionally. It might be due to cohorts effects related to educational differences rather than to age if it is in a longitudinal study when the same individuals are studied over a period of time that is, giving the same intelligence test to the same individuals when they are 40, 50 and at 60 years of age. In both cases, there can be a difference in what is found about intelligence decline. Many factors including alcohol consumption, fatigue, depression and some forms of brain damage, causes more impairment in fluid intelligence than in crystallized intelligence.

Neurophysiological problems, high blood pressure, or other cardiovascular disorders, which can affect blood flow to the brain, can interfere with cognitive performance (Sand & Meredith, 1992). Vision and hearing losses may make understanding test instructions difficult. The time limits on most intelligence tests are particularly hard on older people. Since both physical and psychological processes, including perceptual abilities, tend to slow with age, older adults do better when they are allowed as much time as they need (Schaie & Hertzog, 1983).

### **Information Processing**

Among the information processing changes that takes place in middle adulthood are those involved in speed of processing information, memory, expertise and practical problem solving skills:

#### **Speed of Information Processing**

As noted in the Seattle (1996) Longitudinal Study, perceptual speed declines in early adulthood and continue to middle adulthood. A common way to assess speed information is through a reaction-time task, in which individuals simply press a button as soon as they see a light appear. Younger adults are faster to push the button when the light appears than middle-aged adults. Also, for unknown reasons, the decline is stronger for women than for men (Salthouse, 2000).

### **Memory**

In Schaie's (1996) Seattle longitudinal study, verbal memory peaked in the fifties. However, in some other studies, Salthouse 1991 verbal memory has shown a decline in middle age, especially when assess in cross-sectional studies. For example, in several studies, when asked to remember list of words, numbers, or meaningful prose, Younger adults outperformed middle-aged adults (Salthouse, 1991). Although, there is still some controversy about whether memory decline in the middle adulthood years, most experts conclude that it does decline (Salthouse, 2000). However, some experts argue that studies that have concluded there is a decline in memory during middle age often have compared young adults in their twenties with older middle-aged adults in their late fifties and even have included in the early part of middle age either is nonexistent or minimal, not occurring until the later part of middle age or late adulthood (Small & Wahlin, 2001).

Aging and cognition expert, Park (2001) argues that starting in late middle age, more time is needed to learn new information. Working memory is closely linked to short-term memory but places more emphasis on memory as a place for mental work. In another study, Buhner, Kroner and Ziegler cited in Ziegler, Danay, Asendorpf, Buhner and Opene (2012), investigated the relationship between working memory and the problem solving components of rule of knowledge and the rule of application and discovered that, they were related. Working memory is like a “workbench” where individuals can manipulate and assemble information when making decisions, solving problems, and comprehending written and spoken language (Baddy, 2000).

Linked to the slowdown in learning new information in late middle age, working memory capacity – the amount of information that can be immediately retrieved and used becomes more limited (Leonards, Ibanez & Giannakopoulous, 2002). Think of this situation as an overcrowded desk with many items in disarray. As a result of the overcrowding and disarray, long-term memory becomes less reliable, more time is needed to enter new information into long-term storage, and more time is required to retrieve the information. Thus, Park believes that much of

the blame for declining memory in late middle-age is a result of information overload that continues to build up as we go through the adult years.

Memory decline is more likely to occur when individuals don't use effective memory strategies, such as organization and imagery. By organizing lists of phone numbers into different categories or imagining the phone numbers as representing different objects around the house, many people can improve their memory in middle adulthood.

### **Task and Problem Solving**

The purpose of intelligence, is not to take test but to deal with the challenges of daily life. Research has found a strong relationship between fluid intelligence and certain practical skills that tend to decline with age such as the ability to read a map or a newspaper or to perform everyday task (Willis & Schaie, 1996).

As people get older an important test of cognitive competence is the ability to live independently, as measured by Seven Instrumental Activities of Daily Living (SIADL): managing finances, shopping for necessities, using the telephone, obtaining transportation, preparing meals, taking medication and house -keeping .Willis & Schaie(1999) gave older adults tasks in each of these areas: for example, filing out a medical care form; filing out a mail-order catalogue form; looking up an emergency telephone number; figuring a bus schedule; reading a nutrition label on a food package; reading a medicine bottle label; and reading instructions for using a household appliance. Fluid intelligence and, to a lesser extent, crystallize intelligence accounted for more than half of the variance in performance. Health and educational background affected the results through their effects and cognitive ability. This relationship may be bi-directional. Not only many poor heads and lack of education limit cognition, but people with higher cognitive ability tend to get better educations and take care of their health (Schaie & Willis, 1996). Although, IADLS which depend heavily on information processing skills generally decline with age, that is not necessarily true of the ability to solve interpersonal problems, which tends to have strong emotional overtones and solutions that are less cut and dry. The effectiveness of older adults' responses to such problems often depends on how meaningful the problem is to them (Blanchard-fields, Chen, & Norris, 1997).

In the same study, Blanchard-fields, Chen & Norris (1997), when presented with consumer or home management problems, for which they could draw on a great deal of accumulated experience, older adults tended to use cognitive analysis of



the situation and direct action, whereas adolescents and younger adults tended to avoid or deny the problem or depend on others to solve it. When a problem involved an emotionally charged situation, such as conflict with friends older adults tended to call on a wider repertoire of strategies than younger ones, including both actions and withdrawal.

Denney (2006) assessed practical problem-solving abilities in adults by observing such circumstances as how they handled a landlord who would not fix their stove and what they did if a bank mistakenly did not deposit a check in their account. She found that ability to solve such practical problems increased through the forties and fifties as individuals accumulated practical experience.

## **CONCLUSION**

From the finding, we can infer that intelligence begins building up in childhood, reaches the peak or climax in middle adulthood and begins to decline in late adulthood.

## **Recommendations**

On the basis of the findings of this study, the following recommendations were made:

- 1) Task performance or assignments should be age dependent. This can be achieved by assigning different tasks for different age groups. Mix up should be avoided. A task that is to be assigned to an adult should not be assigned to an old man and vice versa.
- 2) Physical Activity and Nutrition: There is evidence that a healthy lifestyle is vital to increasing intelligence and maintaining healthy brain function because similar to other organs, the brain needs the right kinds of foods and physical exercise to develop and function properly. Performing physical cardiovascular exercises increases brain function by releasing and boosting brain chemicals that can enhance your memory, concentration, energy and speed of thinking.
- 3) Do New Things in New Ways: You can increase your intelligence by training your brain, as you would do to get your dream body. Most people forget that the brain is also a muscle. So break out of the old routine and try new things to trigger dopamine that will boost brain performance. So doing things the hard way exercises your brain
- 4) Adequate Sleep and Rest: Studies have shown that the brain actively

processes and stores the day's memories while you sleep. That's why the brain needs to be recharged. therefore good quality and proper duration of sleep is crucial for proper brain functioning, because when your brain is tired from lack of sleep, it is difficult to concentrate and reason logically. Lack of adequate sleep can have a huge effect on your mental performance.

- 5) Make Time for Reflection: It is not a good idea to saturate the brain with new knowledge without reflecting on what has already been learned. When it comes to a certain point and progress seems stuck, then it is time for reflection, only then will real growth and positive breakthroughs happen. Even if it may be hard, giving a break to your brain and doing a different activity or even daydreaming for a while is a best way to improve and increase intelligence or creativity.

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