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FINANCIAL EDUCATION

AGE OF WISDOM

COGNITIVE CAPABILITIES,
DECISION-MAKING ABILITY
AND FINANCIAL OUTCOMES
ACROSS THE LIFESPAN

About this Executive Summary

This summary presents key findings from Cognitive Capabilities, Decision-Making Ability, and Financial Outcomes Across the Lifespan by Ye Li, Ph.D., Marketing and Management, University of California, Riverside, and Columbia University, Center for Decision Sciences; and Eric J. Johnson, Ph.D., Columbia University, Marketing Division, Center for Decision Sciences and the Consumer Financial Protection Bureau.

The full report, available at www.nefe.org, was prepared in March 2014 to document new research funded by the National Endowment for Financial Education® (NEFE®) to explore how cognitive capabilities relate to real-world financial outcomes for older adults.

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AGING DOES NOT SPELL DOOM

The brain slows with age, but a NEFE-funded study shows that when it comes to financial decision making, financial literacy can offset the decline associated with normal aging.

Fluid intelligence — the set of cognitive abilities related to generating, transforming and manipulating new information — falls significantly* from age 20 to 70. But a person's accumulation of knowledge and experience, particularly in the financial domain, provides an alternative pathway to making sound financial decisions. In fact, financial literacy's effect on financial decision-making outcomes is more than twice the effect of fluid intelligence.

When it comes to financial decisions, *what you know* makes more difference than how fast your brain is.

This is good news, as Americans over age 65 collectively manage 43 percent of household wealth and 47 percent of stocks and mutual funds. Retiring Americans face difficult decumulation decisions of how quickly to consume this accumulated wealth and how to ensure it will last for their remaining years of life. Compounding this difficulty, policy changes have transferred many complex financial and health care decisions to individuals, such as how to allocate retirement savings in defined contribution plans.

The combination of increased wealth and decreased fluid intelligence with age could be a source of social concern. Instead, crystallized intelligence, particularly domain-specific knowledge and expertise, seems to provide an alternative route to sound financial decisions — one that can improve with age.

*Fluid intelligence falls on average nearly two standard deviations from age 20 to 70, a decrease from the 75th to the 25th percentile of adult fluid intelligence, a total of approximately 30 IQ points.

Fluid intelligence is the cognitive ability to generate, transform and manipulate new information. This includes abilities such as processing speed and efficiency, working memory, attention and problem solving.

Crystallized intelligence is a repository of knowledge accumulated through experiences, culture and education.

Financial literacy is crystallized intelligence in the financial domain and is the ability to understand financial information and decisions.

STUDY HIGHLIGHTS

1. The effects of cognitive ability on credit scores are large.

In this study, three factors were shown to affect credit scores: age, fluid intelligence and financial literacy, a domain-specific measurement of financial crystallized intelligence. By far, financial literacy had the greatest impact. With one standard deviation more of financial literacy, a 45-year-old woman would save \$24,207 over the course of a \$300,000 mortgage.* If she instead lost one standard deviation of financial literacy, her credit score would be in the lowest tier above subprime, resulting in \$62,958 additional interest paid over the life of the loan. See the graphic at right to explore relationships between cognitive abilities and credit scores.

2. Financial literacy matters more than domain-general crystallized intelligence.

Support is found for the positive roles of fluid intelligence, patient time preference, and domain-specific expertise — but not for domain-general crystallized intelligence.

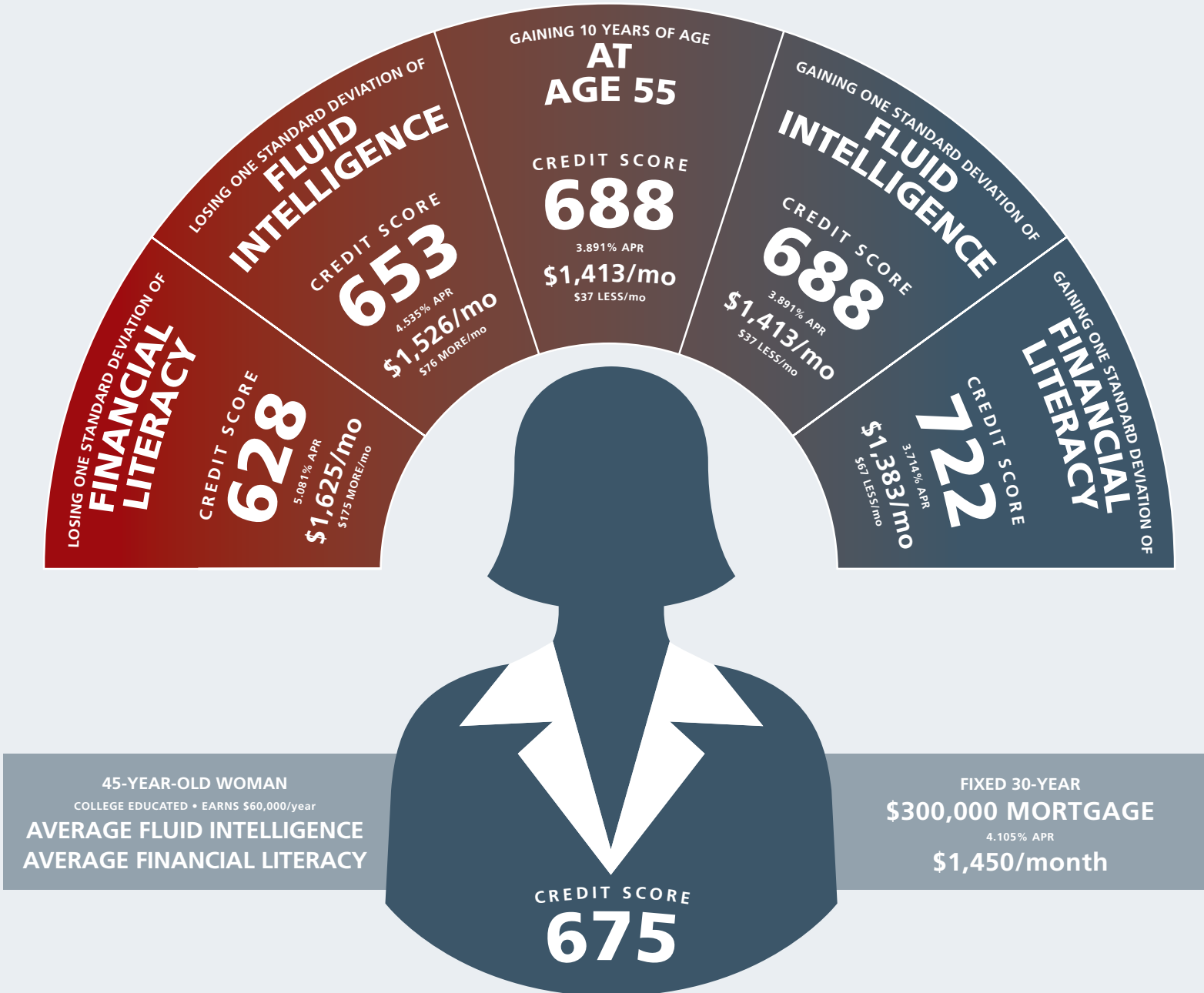
3. The Complementary Capabilities model is supported for a range of financial decisions.

Financial decisions about debt management and health insurance options are supported by the Complementary Capabilities model outlined on page 6.

4. Effects hold even after controlling for time and risk preferences and personality traits.

HOW AGE, COGNITION AND FINANCIAL LITERACY AFFECT CREDIT SCORES

AND HOW CREDIT SCORES AFFECT REAL-WORLD SPENDING



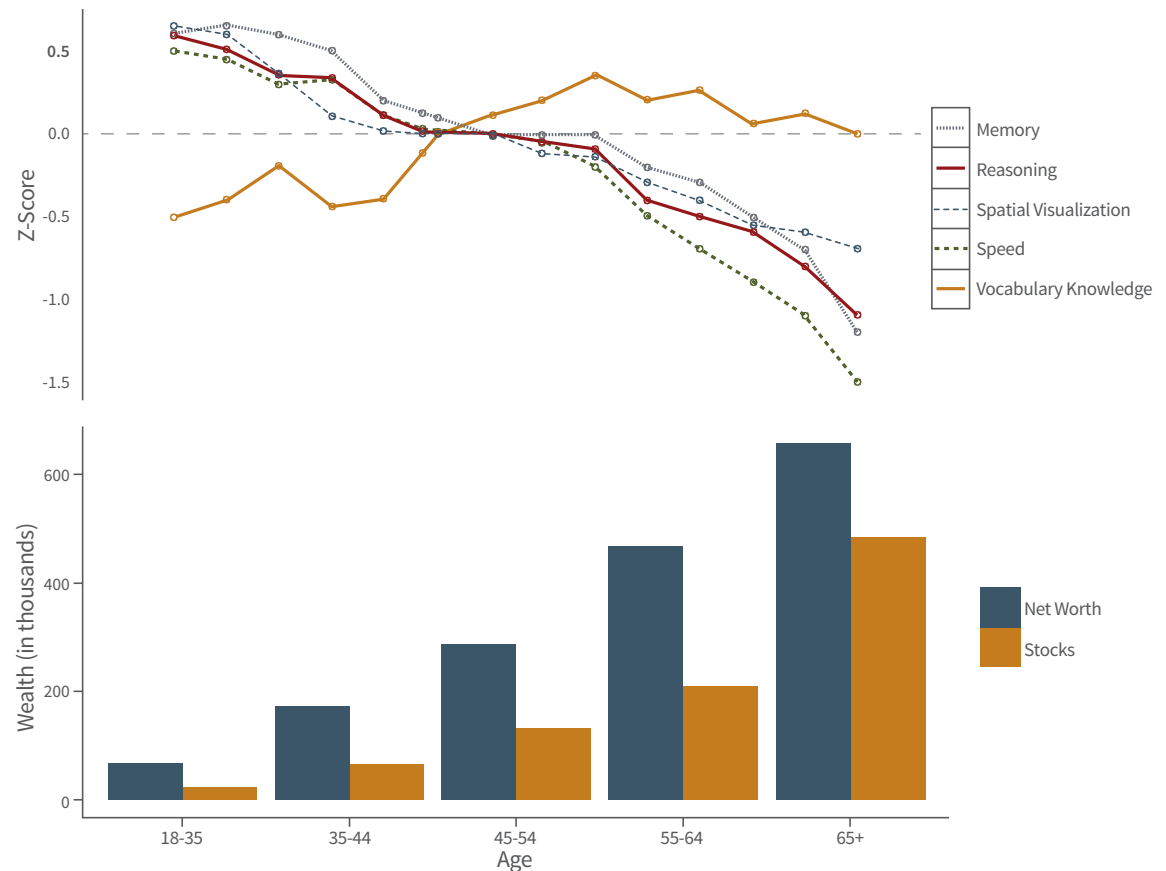
THE COMPLEMENTARY CAPABILITIES MODEL

Although adults lose some cognitive ability as they age, there is a compensating factor: wisdom gained through knowledge and expertise. A related study funded by the National Institute on Aging shows that the combination of older adults' lower levels of fluid intelligence but higher levels of crystallized intelligence contributes to the net effect of age on decision performance, developing a Complementary Capabilities model of decision making across the lifespan.

Experience and knowledge accumulated from past decision making can offset the negative impact of declining fluid intelligence.

Evidence for age-related declines in decision quality is surprisingly mixed. While there are many areas in which older adults perform worse than younger adults, there also are areas in which they perform as well or better. The Complementary Capabilities model shows that using an age group's cognitive strengths can offset their weaknesses, whether dealing with older adults or younger adults.

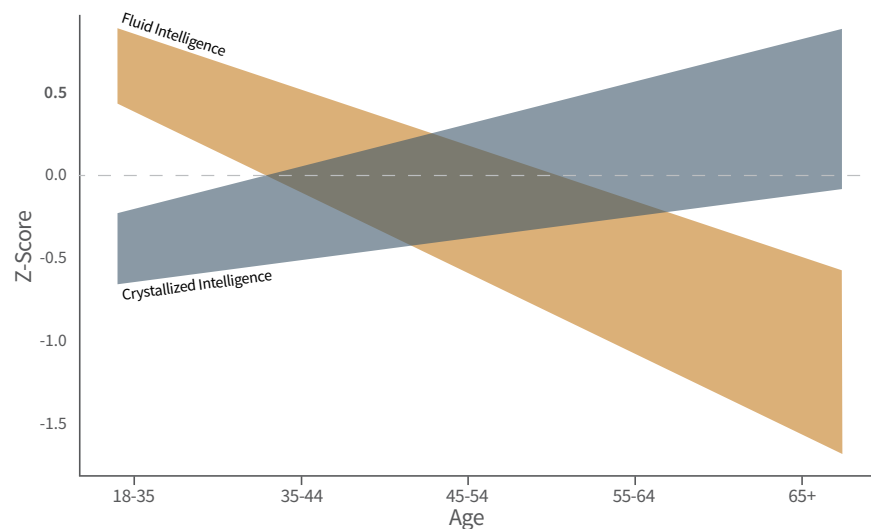
The effect of age on decision quality also depends on the relative impact of the two types of intelligence required for the decision. Decisions that rely heavily on accumulated crystallized intelligence compensate for deficits in fluid intelligence. For example, older adults might be expected



As age and wealth holdings increase, fluid intelligence decreases. This figure illustrates decreases in memory, reasoning, spatial visualization and speed — all components of fluid intelligence — and an increase in vocabulary knowledge, which is a measure of generalized crystallized intelligence. The Z-score measures relative ability for each competency.

to perform better when analyzing stock performance and market trends. The opposite would be true for tasks that require more fluid intelligence, such as calculating a tip or balancing a checkbook. For decisions that may be made equally well using either or both pathways, there may be no net age effect on decision quality.

Note that while crystallized intelligence increases through adulthood, it tends to plateau around age 60. At this point, the effects of crystallized intelligence may diminish and become overwhelmed by normal declines in fluid intelligence or disease processes.



Trend lines show increasing crystallized intelligence and decreasing fluid intelligence over the adult lifespan. The Z-score measures relative ability for each competency.



Using Fluid and Crystallized Intelligence

Contrast the experiences of two shoppers: the bewilderment of an immigrant shopping for the first time in her new country where new brands sell for prices in an unfamiliar currency, with the comfort of an experienced shopper who knows where her favorite products are located, which prices are best, and which brands are better. The accumulated knowledge and expertise of the experienced shopper reduces the need for information processing and active search, both of which rely heavily on fluid intelligence.

DECISION MAKING AND REAL-WORLD FINANCIAL OUTCOMES

The Complementary Capabilities model explains how cognitive capabilities relate to financial decision-making ability. To discover whether the model would extend to important real-world financial behaviors, researchers Ye Li, Ph.D., and Eric J. Johnson, Ph.D., aimed to answer the question: **How do differences in decision-making traits translate to real-world financial outcomes?**

- How does financial performance vary across the lifespan?
- Does the increase shown in older adults' crystallized intelligence compensate for their decreases in fluid intelligence in actual financial behavior?
- Do these relationships hold when controlled for other factors such as income and education, economic preferences and personality traits?



CREDIT REPORT DATA AS A MEASURE OF ECONOMIC PERFORMANCE

This study is the first to combine credit report data with multiple standard measures of fluid intelligence, crystallized intelligence (including financial literacy), and economic preference assessments, such as how much risk people are willing to take and how patient they are in making decisions.

Objective credit report data helped to measure real-world financial outcomes among the study participants. Specifically, credit scores were used because they reflect past decisions, measure creditworthiness, and are widely used by potential lenders, landlords and employers. Maintaining a high credit score reflects a sustained ability to make good financial decisions over one's lifespan, and brings substantial benefits such as lower interest rates and increased likelihood of obtaining loans.

The researchers combined anonymized credit report data from a major credit reporting firm with previously collected measures of cognitive ability and field observations of financial decision-making ability among the sample of 478 U.S. residents between the ages of 18 and 86.

“Until now, we haven’t had the chance to match actual people’s cognitive ability and lifetime knowledge with their personal financial decisions and their money management preferences. This study confirms what we expected was true—that wisdom and expertise counts when it comes to handling one’s finances.”

– Billy J. Hensley, Ph.D., director of education, NEFE

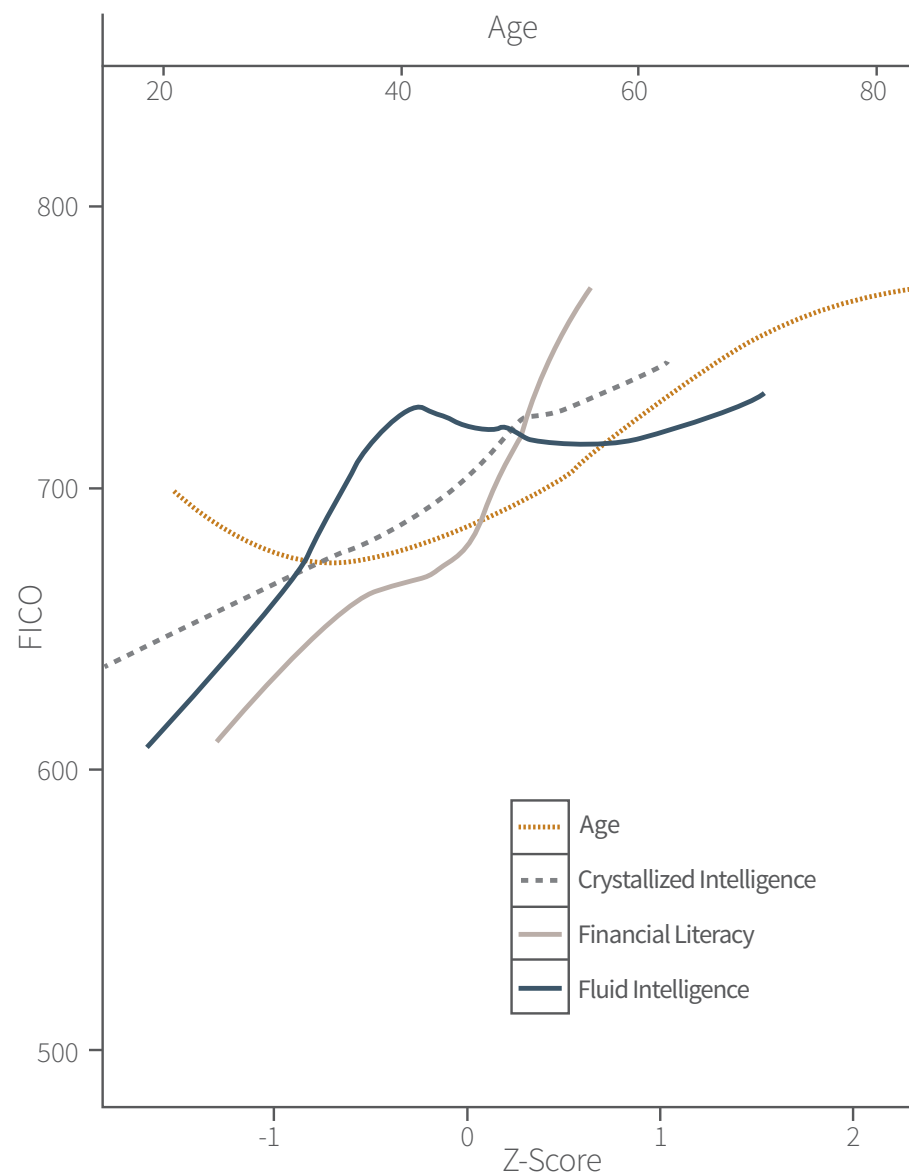
CREDIT SCORES AND COGNITIVE ABILITIES

Researchers collected data on two different types of crystallized ability:

- **Domain-general** crystallized intelligence, measured using standard tests of general knowledge
- **Domain-specific** crystallized intelligence, measured using a test of financial literacy to gauge knowledge specifically related to the context of financial decision making

Initial findings from the study showed a positive relationship between credit scores and fluid intelligence.

However, domain-general crystallized intelligence is not directly related to financial decision-making ability. This is not surprising considering the general knowledge tasks that were used to measure crystallized intelligence. Therefore, researchers focused on a domain-specific measure of financial crystallized intelligence: financial literacy.



Credit scores are shown as a function of age and cognitive ability. The Z-score measures relative ability for each competency.

RESULTS OF THE STUDY SHOW THAT:

1. Credit scores increase with age.

Data shows that credit scores increase by an average of 13 points per decade of age, comparable to the effect of an additional year of education or a doubling of income.

2. Credit scores positively relate to fluid intelligence and financial literacy.

One standard deviation increase in fluid intelligence (conceptually equivalent to 15 IQ points) corresponds to a credit score increase of 22 points, and one standard deviation of financial literacy corresponds to an increase of 47 points. These results are consistent with the prior finding that increasing levels of crystallized intelligence provides an alternative route to good decision making when fluid intelligence is less available in older adults.

3. Financial literacy is not just financial experience.

The fact that financial literacy is positively related to credit scores perhaps is unsurprising, considering that people with more financial history should know more about financial products because they have more experience using them. To differentiate mere experience from knowledge and expertise, models showed that after separating out financial experience as self-reported on 20 different types of financial instruments (e.g., checking accounts, credit cards, mortgages, mutual funds, payday loans, etc.), the effect of financial literacy remains significant, suggesting that good financial decisions require understanding financial products, not just experience using them.



Credit scores are important because they reflect a cumulative series of financial decisions. But to generalize results, researchers assessed the effects of fluid and crystallized intelligence on two specific financial decisions: one related to debt management, the other related to health insurance choices. For both tasks, greater fluid intelligence and financial literacy proved to be an advantage.

CREDIT SCORES AND PERSONAL PREFERENCES

To find out how economic preferences and psychological traits relate to financial outcomes, both were included in the assessments.

Economic preferences are predispositions regarding risks, losses versus gains, and consequences over time which inform real-world decisions with important financial and health consequences. The three main economic preferences are:

- **Risk preference:** the degree to which people prefer safer options to riskier options. People with high risk preference have more debt holdings and trade stocks more frequently than people with low risk preference.
- **Loss aversion:** the degree to which valuations of losses outweigh those gains of the same magnitude. Loss aversion leads investors to focus on avoiding losses rather than making gains. Such investors hold onto losing stocks too long, and loss-averse home owners set higher selling prices.
- **Time preference:** the degree to which people devalue future gains and losses. More patient people have higher credit scores, invest more in retirement saving and have less credit card debt.

Relationships Between Age, Cognitive Ability and Preferences

People with greater cognitive ability are more patient and more willing to take risks, according to previous research. Interestingly, older adults become more risk averse with age, but less loss averse, whereas the relationship between time preference and age is U-shaped: middle-aged adults are more patient than both younger and older adults.





**ONLY PATIENCE IS RELEVANT TO
FINANCIAL OUTCOMES WHEN IT COMES
TO PERSONAL PREFERENCES:**

- **Credit scores are higher for people with patient time preferences.**
The effect of fluid intelligence is no longer significant after controlling for patience, implying that part of the reason that people with higher fluid intelligence have higher credit scores is that they exhibit more patience in financial decisions.
- **The effects of fluid intelligence and financial literacy outweigh personality traits.**
Results for the effect of fluid intelligence and financial literacy do not change when researchers controlled for Big Five* personality measures. Interestingly, level of creativity (intellect) and level of sociability (extraversion) were associated with lower credit scores.

* According to research, the Big Five personality traits are openness, conscientiousness, extraversion, agreeableness and neuroticism.

IMPLICATIONS AND RECOMMENDATIONS

The oldest Baby Boomers now are in their mid-60s, representing the front end of an unprecedented increase in the country's senior population. The ability of older adults to make financial decisions should be an important consideration for educators, policymakers and financial product architects as they contemplate the potential effects of this demographic shift.

Financial decisions and opportunities do not need to be taken out of older hands because of decreases in fluid intelligence. NEFE recommends the following instead:

1. Develop effective tools for increasing financial literacy, including education.

Increased financial literacy positively relates to real-world financial behaviors and can help offset the effects of declining fluid intelligence.

2. Design effective decision environments.

The effect of age will depend on the demands of the task, requiring different aids for older and younger populations. For older adults who have knowledge but have diminished speed and working memory:

- **Decrease the role of reduced fluid intelligence** by minimizing cognitive load. For example, one could limit the number of available options or allow decision makers to sort options by attributes.
- **Maximize the impact of crystallized intelligence** by providing decision environments similar to environments in which experience already exists. However, the age-related trend in crystallized intelligence comes with two important caveats: First, crystallized intelligence increases tend to plateau, suggesting an eventual downward trend in decision ability in later years. Financial capabilities peak around age 60 according to previous research. Second, because its relevance is mainly domain-specific, crystallized intelligence may not help with decisions in radically new financial situations. For example, older people may be at a disadvantage when dealing with reverse mortgages or digital currency.

ABOUT THE METHODOLOGY

Younger adults (18-29) and older adults (60-82) from the Columbia University Center for Decision Sciences' Virtual Lab Panel completed four waves of a Web-based survey consisting of cognitive, decision-making and demographic measures. An NIA grant provided data collection for a new set of approximately 500 participants, including middle-aged adults (ages 30-60), to increase the sample size and strengthen the validity of the findings.

3. Build crystallized intelligence among younger adults through education and training.

Many young adults have high levels of fluid intelligence but lack the knowledge, experience and comprehension needed to make optimal decisions. More frequent opportunities at an early age to gain practical financial knowledge (such as effective money management practices) lead to — and maintain — better decision-making abilities throughout life.

4. Improve effective and relevant financial education.

The Complementary Capabilities model suggests that acquired financial knowledge gained through repeated real world experiences (but not necessarily passive, one-time targeted learning) may be a key driver in improving financial decision making across the lifespan. This reinforces key findings from a recent NEFE-funded meta-analysis*: the impacts of education on financial behavior vary with how much education people receive and when they get it in relation to relevant decisions or behaviors. Financial education must be relevant and timely.



Anyone who presents financial information must be attuned to the ability of older adults to make financial decisions. Decision-making performance depends not only on age, but on the distinct roles of decreasing cognitive abilities and increasing domain-specific knowledge. Tools and education to help older adults must acknowledge this interdependence.

**The Effect of Financial Literacy and Financial Education on Downstream Behaviors*

AGE OF WISDOM

At a time when the world's 65-and-older population will double by 2035, policy changes have transferred many complex financial and health care decisions to individuals. Age-related declines in cognitive ability raise the specter that older adults facing major financial decisions may find them increasingly challenging. This study explores whether knowledge and expertise accumulated from past decisions can offset age-related cognitive declines. Using a unique dataset that combines measures of cognitive ability, knowledge and credit scores (a measure of creditworthiness that reflects sustained ability for sound financial decision making), researchers find that cognitive decline does not spell doom. Instead, domain-specific knowledge and expertise provide an alternative route to sound financial decisions. These results suggest new guidelines for designing effective interventions and decision aids across the lifespan.



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