

Design for the Aging Brain

Commentary on Dr. Gazzaley's *The Aging Brain*

By Patricia Siple

OVER THE PAST HALF CENTURY, much of product design has focused on youth. Electronic devices came with a host of options that excited young users but that few people over 60 ever used. These kinds of developments in manufacturing were dwarfed by the host of web-based products designed to appeal to the cognitive dreams, social and emotional desires, and entrepreneurial spirit of young adults.

Now, the earliest consumers of this new technology have begun to enter the over-sixty generation. This growing population of older adults is healthier, more active, and more affluent than previous older generations—and they have no intention of slowing down. Boomers have been primary targets for new products and designs throughout their lives and they now have more time and freedom available than ever before to engage in new activities. They form a large cohort of potential new users and buyers that bring different sets of challenges to designers.

Aging is accompanied by a complex set of physical and mental changes. To design products for older adults, we need to understand these changes and how they

interact with the designs we create. It isn't enough to know that cognitive slowing and changes in memory ability occur for some older adults. We need to understand the mechanisms that underlie these changes if we are to design products that interface well with older adults' cognitive abilities.

This brings us to the burgeoning field of cognitive neuroscience and the work of Dr. Gazzaley. Attention and memory abilities are crucially linked to a user's interaction with design. Typically, we design products or components to focus attention on the core function of the product. We design the product in ways that intersect with the user's memory and cognitive abilities so that use of the product is seamless. What changes for the

older user? Do we concentrate on making the features of the design more attention grabbing, in other words, more memorable? This might seem like a reasonable approach until we become familiar with Dr. Gazzaley's research.

Using state-of-the-art techniques of cognitive neuroscience, Dr. Gazzaley has changed how scientists think about the relationship between attention and memory as we age. We must attend to information—that is, pay attention to it—in order to remember it.

External data and our internal goals determine the focus of our attention. Internal goals direct our perceptual system toward information appropriate to achieving our goals: I'm hungry so I go into the kitchen. External data then draw our perception to specific locations and objects: my attention is drawn to an object with the shape of my favorite dessert. Our attentional capacity is very limited, so we must block out other possible perceptual information to achieve our goal efficiently and effectively: ignore the pile of mail on the counter and the sound of the cat crying for attention and head for the dessert. Later, when we are in a similar situation, we remember the information that was previously the focus of our attention: I go immediately to the dessert when I'm hungry again.

What Dr. Gazzaley has done is to carefully investigate which parts of this sequence change with age, and describe the nature of the changes that occur. His work reveals that the level of brain activity related to goal-directed attention does not change with age. What does change is the ability to ignore, or block out, other perceptual information that is unrelated to the goal. Instead, very brief shifts of attention to unrelated information (as short as a fifth of a second) slow the older adults' processing speed for relevant information.

These brief shifts of attention to irrelevant information are enough to reduce memory for important information and increase memory for irrelevant information when performance is compared to that of young adults. It isn't necessarily the case that older adults remember less from the experience; they just remember less of the relevant information.

Dr. Gazzaley's work has important implications for product design for older adults. Perhaps the strongest message coming from his work is to avoid clutter when designing for older adults. Our tendency in many design situations is to make important information explicit to the user and assume that the user will direct attention to it. We tend

to think very little about the effect of unrelated information in the interface.

Older users, like younger users, have little difficulty attending to relevant material when the need to attend to it is made explicit. The problem for older users is ignoring information unrelated to their current goal. Attention to irrelevant information slows their processing of relevant information and produces poorer memory for it.

However, the increasing pace of technology has increased the complexity of virtually every product we manufacture. The driver of a new car today is faced with a vast array of displays, knobs, levers, buttons, and control devices. Is it necessary that all of these be visible at all times? Can some types of information or devices be hidden until they become necessary? Can the display of this information be placed under the driver's control?

This was exactly the thinking behind a control I had on my old Saab. That car had a dial that I could use to turn off the illumination to a set of displays on the dashboard. I would use the dial when I had been driving for some time at night and my tiredness made it harder for me to focus on the information important for safe driving. When tired, my cognitive processing ability probably greatly resembled the situation for older drivers.

A classic case of workers having to attend to specific information in a field of possible clutter is that of air traffic controllers. Frank Durso from Oklahoma University recently completed a project with important implications for efficient airspace use and passenger safety. He first determined the various kinds of information traditionally available to controllers. He then carried out interviews and simulator studies to find out what information, from all that was available, the controllers actually needed to perform their job efficiently. The study resulted in an easier-to-comprehend, uncluttered display that produces both greater controller efficiency and increased passenger safety. This new display should certainly enhance performance of aging controllers.

If we can't hide irrelevant information until it's needed or delete it when it's unnecessary, we might be able to alter the additional information so that its presence doesn't have such damaging effects. We see this kind of strategy in some television ads. Something other than written text and talking heads is necessary to engage the viewer. Integrating this additional information into the core message



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keeps the aging viewer focused on the primary ad content.

Some of my favorite ads that use this strategy feature the GEICO gecko. The gecko was introduced some time ago, and became immediately connected to the brand, possibly because of the alliteration in the name. Now the gecko is present in many GEICO ads. Attention may stray from the core message of the ad to the gecko, but the branding of the message is not lost. Ads without iconic attention grabbers like the gecko may hold viewers' attention, but the connection to the brand featured in the ad may not be remembered. Connecting the necessary but less relevant information to

the core use of the product may be especially important for older viewers.

Another aspect of Gazzaley's research examined memory for attended information some time after the initial processing of that information had occurred. In this situation, older adults remember too much information that they should ignore, and too little that is important for their goals. This tendency has implications for the design of websites that place high demands on memory for older users—shopping sites and search sites, for example. In their daily lives, older adults often compensate for reduced memory by making lists. Building lists, or the ability to make lists,



Figure 1 – The third brake light on cars helps reduce accidents for older drivers

into certain kinds of web designs should make them more user-friendly for older users.

For example, shopping sites that make a list of previously viewed items available in an easily viewable and accessible way provide the kind of memory aid that Gazzaley's research indicates older buyers may need. An example of this is the Your Recent History section on Amazon.com which includes Recently Viewed Items and Recent Searches.

Search sites are another place where this strategy may be important. An older adult searching for vacation information may visit several sites before narrowing down the search to a few. If search sites were designed to provide easy ways to highlight or maintain a list of sites for future reference, web searches would be more effective for older users.

Finally, Gazzaley found that even very brief attention shifts from important information to irrelevant information produce significant effects on older adults' processing speed. This has serious implications for design when situations require a fast response under serious time constraints.

Two examples of designs that address this issue are the centrally located third brake light and daytime running lights on cars. The third brake light draws attention to a change in speed of a preceding car and helps the driver maintain attention to it. Daytime running lights function similarly for oncoming vehicles. Both of these additions to automotive design have reduced highway accidents. These design

changes should be of particular importance to older drivers, allowing them to react faster to situations in which even a fraction of a second might mean the difference between a fender bender and a serious accident.

As a neurologist, Dr. Gazzaley is concerned with finding ways to reduce, delay, or prevent changes in the brain as we age. At present, we have only a few suggestions and little data to support their success. Some individuals may be able to delay or minimize the effects Gazzaley describes, but we are far from knowing how to prevent them entirely. With the growing number of older adults and increases in life expectancy, advances in our understanding of changes in the brain as we age create an urgent need for changes in product design strategies that address newly discovered changes in the aging brain. **UX**

About the Author:



Patricia Siple is an associate professor of psychology at Wayne State University. Her primary area of expertise is cognitive psychology, both basic and applied. The focus of Pat's basic research is on language, memory, and attention in both deaf and hearing adults and children. Her applied interests are varied, but she has been most active in areas related to driver behavior and driver safety. Over a period of ten years, she has received contracts from General Motors Corporation to provide expertise and resources related to research in this area.

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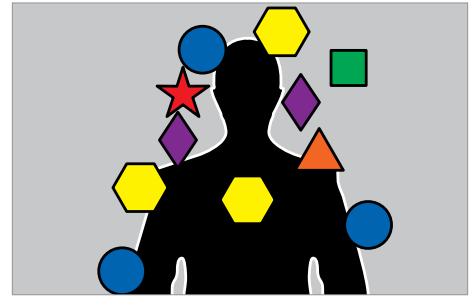


Figure 1—Drawing of the body with participants' comments on attributes of older users.

Fifteen comments (44 percent) focus on physical decline, seven (20 percent) on mental decline, and four (13 percent) on general slowing down. Five comments (15 percent) mentioned an inability to learn new technology ideas or manage physical tasks related to computing, and one mentioned loss of sexuality.

Only two comments (6 percent) explicitly referred to positive attributes. In one case, a contributor noted that with more time on her hands, a relative was able to explore things and take courses about computing. Another respondent reminded us that "an older person is not the sum of his or her ailments—consider attitude and experience."

Summary

The panel discussion surveyed its audience and lumped the final twenty years of working life (ages 46-65 or older) into a single category. This approach was surprising, but demonstrates a disjunction between the youthful audience and the panel members—and contradicts the actuality of an aging U.S. population.

In the idea market session, stimulated by words, pictures, and drawings, UPA conference-goers engaged with the topic of "older users" and told us about real people (age 50 and up) whom we could profile.

We have only begun to scratch the surface of our collective knowledge and creativity around the topic of aging. **UX**

About the Author



Nancy Frishberg is a user experience strategist, based in the San Francisco, California, Bay Area. She employs appropriate qualitative and quantitative methods, turning user research into actionable findings. Among her favorite techniques are design games: playful methods for interacting with customers and users to inform design of products and services.