ABSTRACT: Old age is only partly a biological condition. Environments age as well as bodies, and fortunately that process can be retarded. This article records personal techniques that have proved helpful in offsetting some of the physiological limitations of old age and particularly in making it possible to continue to engage in intellectual work. Problems dealt with include sensory and motor deficiencies, memory loss, motivational changes, mental fatigue, and the disruptive effects of the social environment of the aged. The emphasis is on constructing a world in which the behavior of old people will continue to be abundantly reinforced.

A quarter of a century ago I presented a paper at the Eastern Psychological Association meeting called "A Case History in Scientific Method." In it I pointed out that my life as a behavioral scientist did not seem to conform to the picture usually painted by statisticians and scientific methodologists. The present article is also a case history but in a very different field. I have heard it said that G. Stanley Hall, one of our founding fathers, wrote a book on each of the stages of his life as he passed through it. I did not have the foresight to begin early enough to do that, but I can still talk about the last stage, and so I now present myself to you behaving verbally in old age as I once presented those pigeons playing Ping-Pong.

Developmentalism is a branch of structuralism in which the form or topography of behavior is studied as a function of time. At issue is how behavior changes as one grows older. Aging should be the right word for this process, but it does not mean developing. In accepted usage, to develop is not simply to grow older but to unfold a latent structure, to realize an inner potential, to become more effective. Aging, on the other hand, usually means growing less effective. For Shakespeare the "ages of man" ranged from the infant mewling and puking, to the schoolboy "creeping like snail unwillingly to school," to lovers sighing and soldiers seeking the bubble reputation, to the justice full of wise saws and modern instances, to a stage in which the "big manly voice . . . pipes and whistles in his sound," and then at last to second childishness and mere oblivion—"sans teeth, sans eyes, sans taste," and in the end, of course, "sans everything." The aged are old people. Aging is growing not merely older but old.

In developmentalism the horticultural metaphor is strong. There are stages of growth, and maturity is hailed as a desirable state of completion. But the metaphor then becomes less attractive, for there is a point at which we are glad to stop developing. Beyond maturity lie decay and rot. Fortunately, the developmental account is incomplete, and what is missing is particularly important if we want to do anything about aging. There is no doubt an inexorable biological process, a continuation of the growth of the embryo, which can be hindered or helped but not stopped. In speaking of the development of an organism, growth is no metaphor, but persons develop in a different way and for different reasons, many of which are not inexorable. Much of what seems to be the unfolding of an inner potential is the product of an unfolding environment; a person's world develops. The aging of a person, as distinct from the aging of an organism, depends upon changes in the physical and social environments. We recognize the difference when we say that some young people are old for their years or when, as Shakespeare put it, old people return to childishness. Fortunately, the course of a developing environment can be changed. That kind of aging can be retarded.

If the stages in our lives were due merely to the passage of time, we should have to find a fountain of youth to reverse the direction of change, but if many of the problems of old people are due to shortcomings in their environments, the environments can be improved.

Organism and person do not, of course, develop independently; the biological changes interact with the environmental contingencies. As the senses grow dull, the stimulating environment becomes less clear. As muscles grow slower and weaker, fewer things can be done successfully. Changes in sensory and motor capacities are conspicuous in games and other forms of competition, and athletes retire young just because of aging.

Many remedial steps are, of course, well-known. Eyeglasses compensate for poor vision and hearing aids for poor hearing. These are conspicuous prosthetic devices, but what is needed is a prosthetic environment in which, in spite of reduced biological capacities, behavior will be relatively free of aversive consequences and abundantly reinforced. New repertoires may be needed as well as new sources of
stimulation. If you cannot read, listen to book recordings. If you do not hear well, turn up the volume on your phonograph (and wear headphones to protect your neighbors). Foods can be flavored for aging palates. Paul Tillich, the theologian, defended pornography on the ground that it extended sexuality into old age. And there is always the possibility, secondhand though it may be, of living the highly reinforcing lives of others through literature, spectator sports, the theater and movies, and television.

There is nothing particularly new in all this, but there is a special problem to which little attention has, I think, been given. One of the inexorable effects of biological aging is particularly important for those engaged in intellectual work—in writing, inventing, composing, painting, having ideas—in a word, thinking. It is characteristic of old people not to think clearly, coherently, logically, or, in particular, creatively. In physiological terms we should have to say that deterioration occurs not only in sense organs and effectors but in central processes. The changes are certainly central if we are talking about the nervous system, but changes in behavior are changes in the body as a whole.

Forgetting is a classical problem. It is most conspicuous in forgetting names because names have so little going for them by way of context. I have convinced myself that names are very seldom wholly forgotten. When I have time—and I mean something on the order of half an hour—I can almost always recall a name if I have already recalled the occasion for using it. I work with thematic and formal prompts, in the latter case going through the alphabet, testing for the initial letter. But that will not work in introducing your wife to someone whose name you have forgotten. My wife and I use the following strategy: If there is any conceivable chance that she could have met the person, I simply say to her, "Of course, you remember . . . ?" and she grasps the outstretched hand and says, "Yes, of course. How are you?" The acquaintance may not remember meeting my wife, but is not sure of his or her memory, either.

The failure to produce a name at the right moment, as in making an introduction or giving a name to someone whose name you have forgotten, is a common failing. Stutterers are all the more likely to stutter because they have failed to speak fluently in the past, and an emotional state called "anxiety" has been conditioned. Similarly, we may fail to recall a name when making an introduction in part because of past failings. We are, as we say, afraid we are going to forget. Some help may come from making such situations as free from aversive consequences as possible. Graceful ways of explaining your failure may help. Appeal to your age. Flatter your listener by saying that you have noticed that the more important the person, the easier it is to forget the name. Recall the amusing story about forgetting your own name when you were asked for it by a clerk. If you are skillful at that sort of thing, forgetting may even be a pleasure. Unfortunately, there is no similar strategy when you are suffering from a diminished access to verbal behavior while writing a paper. Nevertheless, a calm acceptance of deficiencies and a more careful observance of good intellectual self-management may have a comparable effect.

The problem is raised by the way in which we make use of past experience, the effects of which seem to fade too quickly. A special set of techniques is needed for its solution. Practical examples may be helpful before turning to comparable intellectual behavior.

Ten minutes before you leave your house for the day you hear a weather report: It will probably rain before you return. It occurs to you to take an umbrella (the sentence means quite literally what it says: The behavior of taking an umbrella occurs to you), but you are not yet able to execute it. Ten minutes later you leave without the umbrella. You can solve that kind of problem by executing as much of the behavior as possible when it occurs to you. Hang the umbrella on the doorknob, or put it through the handle of your briefcase, or in some other way start the process of taking it with you.

Here is a similar intellectual problem: In the middle of the night it occurs to you that you can clarify a passage in the paper you are writing by making a certain change. At your desk the next day you forget to make the change. Again, the solution is to make the change when it occurs to you, using, say, a notepad or tape recorder kept beside your bed. The problem in old age is not so much how to have ideas as how to have them when you can use them. A written or dictated record, consulted from time to time, has the same effect as the umbrella hung on the doorknob. A pocket notebook or recorder helps to maximize one's intellectual output by recording one's behavior when it occurs. The practice is helpful at any age but particularly so for the aging scholar. In place of memories, memoranda.

Another symptom of the same failing is to forget what you were going to say. In a conversation you wait politely until someone else finishes, and your own clever comment has then vanished. One solution is to keep saying it to yourself; another is to appeal to the privilege of old age and interrupt.
the speaker; another is to make a note (perhaps pretending it is about what the other person is saying). The same problem arises when you are speaking and digress. You finish the digression and cannot remember why you embarked on it or where you were when you did so. The solution is simply not to digress—that is, not to interrupt yourself. A long sentence always raises that kind of problem. The last part is not likely to agree with the first because the first has passed out of reach. The effect is especially clear in speaking a language you do not speak well, where it is always a mistake to embark upon complex sentences. You will do much better if you speak only simple sentences, and the same remedy is available to the aging scholar who is giving an impromptu address in his or her own language. Short sentences are also advisable when you are talking to yourself—in other words, thinking.

A different kind of problem is solved by skillful prompting. You are going to attend a class reunion and are talking to someone with whom you must introduce to old friends. How can you remember their names? Before you go, look in your alumni register for a list of those who will be there, visualizing them if you can. The textual stimuli will prompt names that must otherwise be emitted, if at all, simply in response to the appearances of your friends.

Forgetting a name is only a conspicuous example of the essential failing. In writing a paper or thinking about a problem, there are relevant responses that would occur sooner or in greater abundance to a younger person. Their absence is not as conspicuous as a forgotten name, but it must be acknowledged and dealt with. One way to increase the probability that relevant responses will occur while you are writing a paper or solving a problem is to read relevant material and reread what you have written. Reference books within easy reach will supply prompts for names, dates, and other kinds of information. A thesaurus can be used, not to find a new word, but to prompt an old one. Even in extemporaneous speaking it is possible to prepare yourself in advance. You may "put yourself in better possession" of the verbal behavior you will be emitting by rehearsing your speech just one more time.

Old age is like fatigue, except that its effects cannot be corrected by relaxing or taking a vacation. Particularly troublesome is old age plus fatigue, and half of that can be avoided. It may be necessary to be content with fewer good working hours per day, and it is particularly necessary to spend the rest of the time in what the Greeks called eutrapelia—the productive use of leisure. Leisure should be relaxing. Possibly you like complicated puzzles, or chess, or other intellectual games. Give them up. If you want to continue to be intellectually productive you must risk the contempt of your younger acquaintances and freely admit that you read detective stories or watch Archie Bunker on TV.

The kind of fatigue that causes trouble has been called mental, perhaps because it has so little to do with the physical fatigue of labor. You can be fully rested in a physical sense yet tired of what you are doing intellectually. To take appropriate steps one needs some measure of fatigue. Curiously enough, Adolf Hitler can be of help. In a report to the Nieman Foundation, William Lederer has called attention to relevant documents in the Harvard library. Toward the end of the Second World War, Hitler asked the few social scientists left in Germany to find out why people made bad decisions. When they reported that it was when they were mentally exhausted, he asked them for a list of the signs of mental fatigue. Then he issued an order: Any officer showing signs of mental fatigue should immediately be sent on vacation. Fortunately for the world, he did not apply the order to himself.

Among the signs on Hitler's list are several I find helpful. One is an unusual use of profanity or blasphemy. According to that principle, at least two of our recent presidents must have been mentally exhausted. When I find myself saying "damn," I know it is time to relax. (That mild expletive is a sign of my age as well as of my fatigue; I have never felt right about the scatological language of young people.) Other signs on Hitler’s list include an inclination to blame others for mistakes, procrastinating on making decisions, an inclination to work longer hours than normally, an inclination to feel sorry for oneself, a reluctance to take exercise and relax, and dietary extremes—either gluttonous appetite or almost none at all. Clues not on Hitler’s list that I have found useful are especially bad handwriting and mistakes in playing the piano.

Effects on my thinking are much harder to spot, but I have learned to watch for a few of them. One is verbal padding. The ancient troubador sang or spoke standard lines that allowed time to remember what to say next. Phrases like "At this point it is interesting to note . . .," or "Let us now turn to another aspect of the problem . . .," serve the same function. They hold the floor until you have found something to say. Fatigued verbal behavior is also full of clichés, inexact descriptions, poorly composed sentences, borrowed sentences, memorized quotations, and Shakespeare's "wise saws." These are the easy things to say and they come out when you are tired. They can be avoided, if at all, only by avoiding fatigue.

I could have doubled my audience by calling my article "Cognitive Self-Management in Old Age." Cognitive means so many things that it could scarcely fail to apply here. But I could have described
the field much more accurately by speaking of verbal self-management, because the problems are primarily verbal. I have discussed some of them in an article called "How to Discover What You Have to Say," recently published in the Behavior Analyst. At any given moment we are in possession of a latent repertoire of verbal behavior, every item of which presumably has a resting probability of "occurring to us." As a layperson might put it, there are lots of ideas waiting to be had. Some of them have occurred many times, are strengthened by common features of our daily life, and hence are the ideas that it is easiest to have as we think about or write about a problem, but they generally yield hackneyed, shop-worn stuff. What is worth saying—the idea that is possibly unique to us because of the uniqueness of our experience and hence more likely to be called original—is least likely to occur. In short, in old age special difficulties arise because verbal behavior becomes less and less accessible. Perhaps we can do nothing about the accessibility, but we can improve the conditions under which verbal behavior occurs.

It helps to make the behavior as easy as possible; there are no crutches or wheelchairs for the verbally handicapped, but some prosthetic support is available—convenient pens, pencils, and paper, a good typewriter (a word processor, if possible), dictating equipment, and a convenient filing system.

I find it harder to "think big thoughts" in the sense of moving easily from one part of a paragraph to another or from one part of a chapter to another. The intraverbal connections are weak, and inconsistencies are therefore likely. The prosthetic remedy is to use outlines—spatial arrangements of the materials of a paragraph, chapter, or book. Decimal notation is helpful, with successive digits indicating chapter, section, paragraph, and sentence, in that order. This may look like constraint, but it is constraint against senile nattering and inconsistencies and repetition. You remain free to change the outline as a paragraph or chapter develops. An index, constructed as you write, will help in answering questions like "Now where did I take that up?" or "Have I already said that?"

It is commonly believed that those who have passed their prime can have nothing new to say. Jorge Luis Borges exclaimed, "What can I do at 71 except plagiarize myself?" Among the easiest things to say are things that have already been said, either by others or, especially, by ourselves. What we have already said most closely resembles what we now have to say. One of the more disheartening experiences of old age is discovering that a point you have just made—so significant, so beautifully expressed—was made by you in something you published a long time ago.

But one can say something new. Creative verbal behavior is not produced by exercising creativity; it is produced by skillful self-management. The creation of behavior raises the same issues as the creation of species. It is a selective process, and the appearance of something new—the origin of Darwin's title—can be promoted by introducing variations. You are also less likely to plagiarize yourself if you move into a new field or a new style.

One problem is often called a lack of motivation. Aging scholars lose interest; they find it hard to get to work; they work slowly. It is easy to attribute this to a change in them, but we should not overlook a change in their world. For motivation read reinforcement. In old age, behavior is not so strongly reinforced. Biological aging weakens reinforcing consequences. Behavior is more and more likely to be followed by aches and pains and quick fatigue. Things tend to become "not worth doing" in the sense that the aversive consequences exact too high a price. Positive reinforcers become less common and less powerful. Poor vision closes off the world of art, faulty hearing the enjoyment of highly fidelitous music. Foods do not taste as good, and erosogenous tissues grow less sensitive. Social reinforcers are attenuated. Interests and tastes are shared with a smaller and smaller number of people.

In a world in which our behavior is not generously reinforced we are said to lack zest, joie de vivre, interest, ambition, aspirations, and a hundred other desirable "states of mind" and "feelings." These are really the by-products of changed contingencies of reinforcement. When the occasion for strong behavior is lacking or when reinforcing consequences no longer follow, we are bored, discouraged, and depressed. But it is a mistake to say that we suffer from such feelings. We suffer from the defective contingencies of reinforcement responsible for the feelings. Our environment is no longer maintaining strong behavior.

Our culture does not generously reinforce the behavior of old people. Both affluence and welfare destroy reinforcing contingencies, and so does retirement. Old people are not particularly important to younger people. Cicero made the point in his De Senectute: "Old age is honored only on condition that it defends itself, maintains its rights, is subservient to no one, and to its last breath rules over its own domain." We neglect that sage advice when we turn things over to another generation; we lose our position in the world and destroy important social reinforcers. Parents who turn their fortunes over to their children and then complain of neglect are the classical example, and aging scholars often do something of the same as they bring their work to an end in the expectation that they will be satisfied with...
well-deserved kudos. They find themselves out of
date as the world moves forward.

A common reinforcer affects old age in a dif-
ferent, though equally destructive way. Aging schol-
ars come into possession of a unique stock-in-
trade—their memories. They learn that they can
hold a restless audience with personal reminiscences.
“Thorndike? Oh, I knew him well.” I have been
guilty of a bit of that name-dropping myself when
other reinforcers were in short supply, and I have
been wallowing in reminiscence lately in writing my
autobiography. The trouble is that it takes you back-
ward. You begin to live your life in the wrong di-
rection.

There are other things than memories to be
exploited by the aged, and a careful assessment of
one’s possessions may be helpful. Harvey Lehman
found that in certain fields—theoretical physics, for
example—the best work was done well before the
age of 40. What should theoretical physicists do with
the rest of their lives? Some 20 years ago I asked
Lehman that question about myself (I trust that my
personal reference to Lehman has gripped you). I
felt that my science was fairly rigorous, and perhaps
I was near the end of a productive life as an experi-
mental physicist. What should I do with myself? “Admin-
istration,” Lehman said. But I had been a depart-
ment chairman, and that was not an attractive al-
ternative. I turned instead to broader issues in the
design of a culture, culminating in the publication
of Beyond Freedom and Dignity.

Something more than subject matter is in-
volved. The whole repertoire we call intellectual is
acquired when one is young. It survives as a life-
style when one grows old, when it is much harder
to execute. If intellectual behavior were as conspi-
cuous as baseball, we would understand the problem.
The solution may simply be to replace one repertoire
with another. People who move from one city to
another often suffer a brief depression, which ap-
ppears to be merely the result of an old repertoire of
behavior having become useless. The old stores, res-
taurants, theaters, and friends are no longer there.
The depression is relieved by acquiring a new rep-
ertoire. It may be necessary in old age to acquire
new ways of thinking, to adopt a new intellectual
style, letting the size of the repertoire acquired in
a long life offset the loss of skill in making use of
it.

We should ask what we have written papers or
books for. In the world of scholarship the answer is
seldom money (if we exclude writers of pot-boiling
textbooks), and in any case, economic circum-
stances in old age are not easily improved. If the
answer is commendation or fame, the problem may
be extinction if commendation no longer follows, or
satiation if there is a surfeit of commendation. Not
much can be done about that, but a more likely
explanation, and one which suggests helpful action,
is that the scholar at his or her desk is not receiving
the previously accustomed, immediate reinforce-
ments: Sentences are not saying what they should
say; solutions to problems remain out of reach; sit-
uations are not being effectively characterized; se-
quencies are not in the right order; sequiturs are too
often non. Something can be done about that, as I
have suggested in the article mentioned earlier.

Reinforcers need not occur too frequently if we
are fortunate enough to have been reinforced on a
good schedule. A “stretched variable-ratio schedule”
refers to a process you have all experienced as you
acquired a taste for good literature, in which the
reinforcing moments occur much less often than in
cheap literature. In a comic strip you laugh at the
end of every four frames, and in cheap literature
something interesting happens on almost every page.
Learning to enjoy good literature is essentially learn-
ing to read for longer and longer periods of time
before coming upon a moving passage—a passage
all the more moving for having required a long prep-
arration. Gambling is reinforced on a variable-ratio
schedule, and pathological gamblers show the effect
of a history in which they began with reasonable
success and only later exhausted their resources.
Many of the reinforcers in old age tend to be on a
stretched variable-ratio schedule. The Marquis de
Sade described many interesting examples. The same
process may explain the persistence of the aging
scholar. If your achievements as a thinker have
been spaced on a favorable schedule, you will have
no difficulty in remaining active even though cur-
cent achievements are spaced far apart. Like the
hooked gambler, you will enjoy your life as a thinker
in spite of the negative utility.

An audience is a neglected, independent vari-
able. What one says is determined in a very impor-
tant way by whom one is talking to. But the retired
teacher no longer talks with students, the retired sci-
entist no longer discusses work with colleagues. Old
people find themselves spending time with others
who are not interested in their fields. They may re-
ceive fewer invitations to speak or find it harder to
accept them. Those who will read the papers or
books they are writing are much too far removed
in time to serve as an audience. An appropriate
measure of intellectual self-management is to or-
ganize discussions, if only in groups of two. Find
someone with similar interests. Two heads together
are better than both apart. In talking with another
person we have ideas that do not occur when we are
alone at our desks. Some of what we say may be
borrowed from what the other says, but the mere
effect of having someone to say it to is usually conspicuous.

In searching for an audience, beware of those who are trying to be helpful and too readily flatter you. Second childishness brings you back within range of those kindergarten teachers who exclaim, "But that is very good!" Except that now, instead of saying, "My, you are really growing up!" they will say, "You are not really getting old!" As I have pointed out elsewhere, those who help those who can help themselves work a sinister kind of destruction by making the good things in life no longer properly contingent on behavior. If you have been very successful, the most sententious stupidities will be received as pearls of wisdom, and your standards will instantly fall. If you are still struggling to be successful, flattery will more often than not put you on the wrong track by reinforcing useless behavior.

Well, there you have it. I have been batting that Ping-Pong ball back and forth long enough. I have reported some of the ways in which I have tried to avoid growing old as a thinker, and in addition I have given you a sample of the result. You may wish to turn to another comparison with a different species and conclude, if I may so paraphrase Dr. Johnson, "Sir, an aged lecturer is like a dog walking on his hinder legs. It is not done well; but you are surprised to find it done at all."