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Mystery of Memory

By Dr. Sanjay Gupta

SANJAY GUPTA, HOST: Hello, and welcome. I'm Dr. Sanjay Gupta.

Some of us worry that our memory isn't what it used to be, or that we're suffering from information overload. We may fear Alzheimer's, even as we cherish memories of childhood or a first kiss. But what is memory? In the next hour, we're going to see how memory works and how it fails. We also have some tips on improving your memory.

First, we meet a man with amnesia.

(BEGIN VIDEOTAPE)

GUPTA (voice-over): For Chuck Ozug, today is all there is. All of his yesterdays vanished to nothing. A cardiac arrest damaged Ozug's brain. And the 53-year old is unable to form new memories.

CHUCK OZUG: People can call. And I can still get what they've said before they've hung up. Bothers me. That never used to be the case.

MIEKE VERFAELLIE, PHD,
VETERANS ADMINISTRATION: So but you're here today again because we'd like to talk a little bit to you about what it's been like for you.

GUPTA: On this day, Ozug and his wife Marianne see Mieke Verfaellie, a researcher who is studying Ozug and others with amnesia.

VERFAELLIE: So what year are we now?

OZUG: 2004.

VERFAELLIE: Close, but we actually celebrated New Year's recently.

GUPTA: Less than half an hour later, Verfaellie asks again.

VERFAELLIE: Tell me again what year it is now?

OZUG: It is 2004.

VERFAELLIE: Does - are you confident of that?

OZUG: No.

VERFAELLIE: Without memory, we are in a sense devoid of content. There's just emptiness.

GUPTA: At home, Ozug fills this emptiness with puzzles and "The Boston Globe."

OZUG: I'll forget right after I've read it. Unless I highly passages, once it's highlighted, it's there as evidence of what it was that I thought was important to look at on that particular day.

GUPTA: And the former high school English teacher writes poetry about his condition.

OZUG: My memory, like snowflakes, soft, faint, snowflakes soothing only for a while.

JAMES MCGAUGH, PHD,
UNIVERSITY OF CALIFORNIA,
IRVINE: Memories are essential to our
lives. They define us. They are who each
of his - of us happens to be.

GUPTA: Dr. Eric Kandel won the Nobel Prize for his research on memory.

ERIC KANDEL, NOBEL LAUREATE: It's extraordinary. It's the glue that ties the fabric of our empty life together. I can sit here and do mental time travel. I can think about my childhood in Vienna. I can think about my first date. I can think about getting married. I can think of going to medical school.

With an enormous facility, I can move back and forth in my mind between different events that occurred because of the powers of my memory to do this.

GUPTA: Researchers say memories, even memories of the same event like a wedding, are not stored like snapshots in

your brain. There is no single imprint, but many, as sights, sounds, and other information are stored in various parts of the brain, the parts that initially process the information.

Professor James McGaugh has researched memory for 50 years. MCGAUGH: Now what we do when we recall is not go into a specific part of the brain and pull out the memory that happens to be there. Much as if we go to the library, and find the book that is located there, but rather, we say we would like to find out about it, we go to the brain and access that. And then pull out and reconstruct - pull out and reconstruct from that, almost like a net.

GUPTA: It's a net made of nerve cells connecting at special junctions called synapses. The more connections, the stronger the memory.

Put me to the test.

UNIDENTIFIED FEMALE: You're ready to go?

GUPTA: Yes.

Using the latest F MRI brain imaging technology, researchers like Robert Stoore hear into our brains and watch memories actually being born.

ROBERT STOORE: So right now, Sanjay is using his hippocampus. This is testing spatial memory. So she had to remember a specific location without this room.

GUPTA: The hippocampus is a horseshoe part of the brain essential to

making long term memories. In this water maze experiment, I need to remember which of the yellow balls marks the water above a hidden platform. I use a joystick to navigate. If I go to the wrong ball, I hear this.

STOORE: Sanjay's figured it out. It's next to this book shelf. And there's a pillar to the right.

GUPTA: Tell me about my hippocampus?

STOORE: That's perfect.

GUPTA: So are you saying my brain is perfect?

STOORE: I'm not quite saying that. I'm saying I don't see any abnormalities.

GUPTA: Good enough. I'll take that.

STOORE: OK.

GUPTA: You start forming basic memories at birth, possibly even earlier, remembering our mother's voice, for example. As adults, it's extremely rare to remember anything before third or fourth birthday possibly because our hippocampus is not fully developed.

UNIDENTIFIED FEMALE: You write your own sentence.

GUPTA: Even at a young age, our brains are capable of retaining extraordinary quantities of information. Abby Julo, age six, is a poster child for the learning power of the young.

UNIDENTIFIED MALE: Who's the president of China?

ABBY JULO, SIX YEAR OLD: Jintao Hu.

UNIDENTIFIED MALE: Right.

GUPTA: With coaching from her father, the kindergartner has learned the names of world leaders, all 15 cabinet members, past presidents, first ladies and constitutional amendments. She can even recite Martin Luther King's "I have a dream speech."

JULO: Shall I say you, my friends, that even though we must face the difficulties of today and tomorrow, I still have a dream. It is a dream deeply rooted in American dreams, that one day this nation will rise up and live out the true...

GUPTA: Any healthy person can improve his memory.

SCOTT HAGWOOD: Ace of hearts, ace of clubs, two of hearts.

GUPTA: Scott Hagwood trains his memory the way an athlete trains his body. He started five years ago to combat one of the side effects of radiation treatment for thyroid cancer, memory loss.

HAGWOOD: I never was the sharpest knife in the drawer anyway, but I thought I can't do a lot about the physical part, the blood pressure, and metabolism, that kind of thing, but I thought maybe there might be some things I can do to keep my memory relatively sharp.

GUPTA: Hagwood, an average college student entered the USA Memoriad, a yearly memory Olympics where contestants memorize decks of cards, lists of words and numbers, and poetry. He won.

Not all memories are created equal.

The amygdala be couple inches in here.

University of California-Irvine researcher Larry Cahill studies how emotion affects memories. His test subjects view a slide show of emotionally charged pictures and pictures that are more innocuous. They then immersed their hands in ice water to trigger stress hormones.

LARRY CAHILL, PHD, UNIVERSITY OF CALIFORNIA-IRVINE: When an emotional event happens, and the stress hormones are flowing, those stress hormones serve the initial fight or flight reaction that everybody knows about. Learn about that in high school.

But these same stress hormones we think have a second longer term reaction.

GUPTA: That second reaction? Stress hormones feeding back to the brain through the amygdala, located a couple of inches in from your ear on either side of your brain.

It helps you remember more clearly and longer. Have you ever wondered why a smell can trigger such a strong memory? Once again, the amygdala may hold the answer.

CAHILL: The amygdala is this key structure in the whole emotion and memory world. And guess which sense goes straight into the amygdala? Do not pass go, do not collect \$200. Go from the air straight in. It's your nose.

There's basically two synapses between an odor hitting your nose and activating your amygdala.

GUPTA: Our memories of smell are emotionally powerful, but not always specific. Since September 11th, researchers say many New Yorkers report being saddened by the smell of smoke.

DANIEL SCHACTER, PHD, HARVARD UNIVERSITY: Our memory is not a tape recorder. And what it's very good at is retaining the general sense of our experiences, the meaning, the gist, if you will of what happened to us.

(END VIDEOTAPE)

UNIDENTIFIED FEMALE: An imprint into memory is not unlike a fingerprint on a murder weapon.

UNIDENTIFIED FEMALE: Coming up, memory, stress, and the eyewitness. Could you remember this face or this one? And later, how to keep your memory sharp. Lessons from a memory champion. And the doctor who says he can boost your memory in just two weeks.

UNIDENTIFIED MALE: You can take control. You can make a difference. And you can see results right away.

(BEGIN VIDEOTAPE)

GUPTA (voice-over): When we think we'll never forget a certain face or an experience, we say things like it's etched in my memory, or it's burned in my mind. But memory isn't an exact record like a snapshot.

So how much can we really trust it?

UNIDENTIFIED MALE: I'm not going to listen to any more lies from you. You've been lying me off and on ever since we started this interview.

GUPTA: You think it would be unforgettable. Imagine, nearly an hour face to face, an interrogator leans in, cajoling, then threatening, demanding the code word.

This is the military's elite survival school at Fort Bragg in North Carolina. The final exam? Three days of hell. Hiding and starvation in the woods, inevitable capture, and interrogation by an instructor playing the role of a brutal warden in a POW camp.

If you want to study the effect of stress on memory, this is the place.

Dr. Andy Morgan of Yale University tested trainees during the mock interrogation. Not surprisingly, he found that stress measured by hormone levels is extremely high.

ANDY MORGAN, YALE UNIVERSITY: When I say extraordinarily high, I mean, specifically

that it's higher than levels that we've seen in people who are landing on the airport carrier at night for the first time. It's higher than people who are skydiving for the first time. So the physical pressure can be up. People can actually physically touch them. And their heart rate goes way up to about 165, 175 beats a minute.

GUPTA: A day later, Morgan showed trainees a line up, like the ones used by police. Could they identify the guard who was grilling them? Remarkably, the answer for most was no.

Details of the training are classified. The military did not let us film the mock interrogation. But we can say the interrogator's face is uncovered and comes within inches of the squirming prisoner.

And yet, when shown a set of photos, only 34 percent could identify the man or woman who had confronted them. In the experiment, the eyes were not covered, as they are here.

MORGAN: People picked a male when it was a female who had interrogated them. And other people swapped the gender. They said no, it was a female when it was a male.

But yes, we had people who were interrogated man, who picked black man in the line up and my other minorities. We had people who were picking folks as their interrogator who have hair on their head, when in fact their interrogator was bald.

GUPTA: When photos were shown one by one, instead of all at once, accuracy was a little better, but still just 49 percent.

Memory may have suffered from lack of food and sleep. But Morgan says stress was the key. And that the more stress the trainee registered, the less accurate he was.

MORGAN: So the high stress event, whether you did live line ups, photo spreads, or the sequential photo line up, you would have done better flipping a coin.

GUPTA: Surprising? Not to Elizabeth Loftus, an expert on eyewitness memory.

As we saw earlier, stress burns in some aspects of memory. Unfortunately, Loftus says, under stress, our mind records fewer details in the first place.

ELIZABETH LOFTUS, PHD, UNIVERSITY OF CALIFORNIA-IRVINE: And so, contrary to a common belief that oh my God, I was so frightened, it's imprinted in my brain, in fact, our memories for the details of traumatic events can be impaired and are subject to manipulation.

GUPTA: Jeannie Boylan makes a living by mining those very details. A top ranked freelance artist, she has sketched subjects for the FBI and police departments around the country.

From the Unabomber, to the Oklahoma City bombing, to the Polly Klaas kidnapping, she's worked the biggest

cases around. In 1987, a bomb badly wounded the owner of a computer store in Salt Lake City, Utah. Minutes earlier, a worker there had caught a glimpse, just a two second glimpse of the man leaving the suspicious package.

Seven long years later, Boylan was called in to meet the lone eyewitness. The result was this famous sketch, the hooded Unabomber. A good likeness? Judge for yourself.

UNIDENTIFIED FEMALE: Your memory may have been stored in the interim, but the odds of that original memory being there extremely good.

GUPTA: At most police departments, a witness to a crime either looks through mug shots, or picks and chooses from a menu of facial features, until an artist or computer creates a composite.

But researchers have found that these techniques actually impair memory, as the witness concentrates on each new image, the original memory is blurred.

JEANNIE BOYLAN, FREELANCE ARTIST: Hate those books. An imprint into memory is not unlike a fingerprint on a murder weapon. So when police show witnesses, you know, eyes and lips and noses in books and books, facial features and expect that memory to be static, what they're actually doing is overlaying the imprint in memory with all these new additional prints, just as they would be overlaying fingerprints on a murder weapon if they handed it to barehanded people.

GUPTA: Boylan's method is different. Her interviews are long, about 12 hours. But most of the talking has nothing to do with the crime. She relaxes the witness and lets memories come to the surface.

She's careful not to suggest details, which is tougher than you might think.

The contamination of an eyewitness. So I mean, how subtle can it be? You just said if the investigator says were his eyes brown, is that contamination?

BOYLAN: That's absolutely contamination, yes.

GUPTA: Police line-ups pose similar problems. Different methods, different results. Even in Morgan's study, recognition was much better when pictures were shown one at a time. So the witness couldn't comparison shop, as he put it. But real life practice is catching up. Since last summer, police in Boston use only the one picture at a time method. And to prevent inadvertent suggestion, the officer running the line-up does not know the real suspect.

A handful of other cities have made similar reforms.

Some departments are reluctant to change because they know that witnesses will not only make fewer mistakes, they'll pick out fewer suspects, too.

There is one more thing. As Morgan and others have found, confidence has not relation to accuracy.

MORGAN: We had them use the scale. 0 to 10 and 10 was I'm absolutely sure, there is not a doubt in my mind. And most people circle the 9.

GUPTA: Intuition tells us that some memories are indelible. But research shows otherwise. When it comes to memory, we often can't trust our own eyes.

Is it possible to create a detailed false memory from a simple suggestion? Elizabeth Loftus, a professor at the University of California-Irvine, says it's easier than you think.

To prove it, she took a Disney print advertisement and doctored it.

LOFTUS: We created a fake ad for Disney. And you can see here's Bugs Bunny sitting by the magic castle.

GUPTA: Bugs Bunny is a Warner Brothers character owned by CNN's parent company Time Warner and is not part of the Disney menagerie.

LOFTUS: We find many people who were exposed to this ad will claim that they met Bugs Bunny at Disney.

GUPTA: Which it never happened?

LOFTUS: It couldn't have happened.

What's really exciting is when you ask these people, now what is it you remember about that time you met Bugs? Not only will they remember that they shook his hand, which is part of the suggestion, but that things like they

touched his ear, they touched his tail,
they heard him say what's up doc.

(END VIDEOTAPE)

UNIDENTIFIED FEMALE: Next up,
memory aid Scott Hagwood teaches us
how he does it.

And later, war and remembrance. What
happens to the brain when wartime
memories won't let go.

GUPTA: Memory champion Scott
Hagwood says almost anyone can
develop phenomenal recall. The
technique, whether it's remembering
cards, or words, or names, is to think in
pictures.

(BEGIN VIDEOTAPE)

GUPTA: All he needs is a second with
each card and Scott Hagwood can
remember half the deck.

SCOTT HAGWOOD, MEMORY
SPECIALIST: The last card I think was
the 8 of diamonds.

GUPTA: There it is. Talk me through
this.

HAGWOOD: I'm converting the cards to
images or to experiences that are
personal to me. For example, the four of
hearts is an experience. And this case,
it's a rabbit. And I can feel the fur. And I
can see the whiskers moving because our
physical eyes train for movement. So is
our mental eye.

GUPTA: Once he has the image, he
places it in his mind in a part of his

house, beginning with the corner of his
living room.

HAGWOOD: The way that I organize
our minds is I walk through my house.
Because I've got at least 10 rooms in the
house. And each one of those rooms has
four corners, four walls, a floor and a
ceiling.

GUPTA: Now it's my turn.

HAGWOOD: You see the 6 of
diamonds. Is there anything that comes
to your mind?

GUPTA: The type of ring that my wife
would have liked for her engagement.

In my mind, I picture that diamond ring
on a computer in the corner of the
studio.

I actually see the ring sort of on the
screen itself.

HAGWOOD: OK, is there any way that
you can give that ring movement?

GUPTA: I'm off. And a few moments
later, I'm put to the test.

HAGWOOD: Sixth card?

GUPTA: Seven of clubs.

HAGWOOD: Yes. 7th card?

GUPTA: Eight of diamonds.

HAGWOOD: Eight?

GUPTA: Eighth card is jack of spades.

HAGWOOD: Nine?

GUPTA: Four of clubs.

HAGWOOD: Ten?

GUPTA: Nine of spades.

HAGWOOD: Excellent.

GUPTA: It works. If I can learn it, anybody can learn it.

(END VIDEOTAPE)

UNIDENTIFIED FEMALE: There's much more to come in the next half hour.

UNIDENTIFIED MALE: Just on the helicopter. Just never forget that sound.

UNIDENTIFIED FEMALE: When memories are too much to handle. Old soldiers and new military research.

Then the doctor who says he can help us fight off Alzheimer's.

UNIDENTIFIED MALE: When we looked at it over the next five years, if everybody did that, and if all our assumptions were true, we would reduce the number of cases in the United States by a million in just five years.

UNIDENTIFIED FEMALE: And later, could a machine like this help replace a failing memory?

DR. SANJAY GUPTA, CNN
CORRESPONDENT: Harvard
psychologist Daniel Shackter (ph) has
studied the ways our memories fail us

and he's written about them in the
"Seven Sins of Memory." Transience.

DANIEL SHACKTER: Memories tend
to fade over time.

GUPTA: Absentmindedness.

SHACKTER: Lapses of attention.

GUPTA: Blocking, when a word is on
the tip of your tongue.

SHACKTER: We can't get at the
information at the moment that we want
it.

GUPTA: Misattribution.

SHACKTER: This occurs when some
form of memory is present, but it's
wrong. GUPTA: Suggestibility.

SHACKTER: This occurs when we
remember things that did not happen or
we remember things differently from the
way that they actually happened.

GUPTA: Hindsight bias.

SHACKTER: This occurs when our
present knowledge, beliefs and feelings
skews or distorts or memory for past
events.

GUPTA: And persistence.

SHACKTER: Persistence occurs when
we have a vivid memory, often an
emotionally arousing or traumatic
memory that we wish we forget, but we
can't.

UNIDENTIFIED FEMALE: Here's Dr. Sanjay Gupta.

GUPTA: With memory, the seventh sin is persistence, a memory that won't go away. It often starts with a bad experience. For a young man named Esteban Lora, that came on the battlefield.

SPC. ESTEBAN LORA, ARMY NATIONAL GUARD: There are a lot of things that I see every day to day, that remind me of Iraq, but for the new year, and to walk outside the door and you see all these things flying around and you hear the firecrackers popping, it's like for a second, you're like whoa.

GUPTA: Esteban Lora is 22 years old, a college student in Miami and a war veteran with a purple heart. He battled insurgents in a notorious Sunni triangle. Last July, he was on patrol with friends who were badly wounded in an ambush.

LORA: One of our vehicles in a convoy got (INAUDIBLE) remember hearing, there's an RPG. They just shot an RPG at us. I could hear my friends saying look on the bright side guys, it's 12:00. We're going to be done soon. And just yeah, boom, just a ball of fire.

GUPTA: Four months later, he was wounded himself by a roadside bomb and sent home. The scars on his hand and foot have healed over, but mentally...

LORA: I was angry, very emotional, very emotional.

GUPTA: A doctor at the Miami VA hospital diagnosed him with post traumatic stress disorder. PTSD encompasses a wide range of symptoms. Nightmares and flashbacks are common. A signature complaint is that the smallest stimulus, like a noise, triggers a flood of painful overwhelming memories. It leads to jumpiness, anger and depression. Of course, during intense stress like combat, some of these feelings are normal, even beneficial.

DR. J. DOUGLAS BREMNER, EMORY UNIVERSITY: In combat situations, it's (INAUDIBLE) to have an increased fear response, but when you come back to stateside and you're no longer in a life-threatening situation, it's also important to be able to shut off those fear reactions. PTSD was really a failure to learn how to turn off the fear response.

GUPTA: Psychiatrist Douglas Bremner is at the forefront of scientific research on people with PTSD. With advance imaging technology, he and others have been able to pinpoint actual changes in the brain, including decreased activity in the brain's frontal cortex, normally used to signal whether the body is facing a threat. In PTSD patients, you also see changes in the amygdala, which governs our gut reaction to smell, sounds and sights.

LORA: Like when I would see something on the road, I'm driving and the first thing when I see it on the road, the first thing I think oh my God, is that a bomb? But it takes me a couple seconds to register it's not a bomb. It's garbage.

GUPTA: Perhaps the biggest difference is in the hippocampus, that area so central to memory. In people with PTSD, it is significantly smaller than in healthy people. Earlier we saw mine being scanned. My healthy brain could remember exactly where to go in the (INAUDIBLE) but PTSD patients have trouble with this. In real life, they can have trouble recalling directions or what to buy at the store. A damaged hippocampus leads to other problems too. Severe absentmindedness and intrusive fearful memories. See the difference?

Here's my brain during the task. The areas lighting up so brightly are the two sides of the hippocampus, but on a PTSD patient, the hippocampus isn't lighting up at all. There's no focus of activity. A study in the "New England Journal of Medicine" found that one in eight troops home from Iraq met the criteria for PTSD. Some leading psychiatrists think that estimate is too high, but with more than 160,000 troops in Iraq and Afghanistan, there's no doubt thousands are at risk.

Now the military is playing a bigger role in research, hoping to help soldiers like Esteban Lora. Fort Drum in upstate New York is home to the Army's tenth mountain division, 14,000 soldiers, including some of the first units on the ground in Afghanistan and Iraq. This spring, Fort Drum's chief psychiatrist starts a groundbreaking study with scientists from the National Center for PTSD, the same researchers who examined my brain. The eventual goal,

to develop better training to prevent PTSD and better treatments.

MAJOR PAUL M. MORRISSEY, MD, U.S. ARMY PSYCHIATRIST: It's important because our treatments are based on these studies of Vietnam veterans and civilians and we think there are some reasons that PTSD is different in our soldiers.

GUPTA: The soldiers will undergo several tests, including the same ones I did earlier. It's the first time that extensive brain imaging has been done on active duty troops. Now what researchers hope to answer is this: is there some characteristic in the brain that might protect someone against giving PTSD in the first place or perhaps which makes them more vulnerable.

Dr. Bremner is also forging ahead, studying twins to see if brain differences are the result of stress and trauma or a preexisting risk factor. So far he says, it seems to be a combination. John and James Bowles (ph), identical twins, are part of Bremner's study. Both served in Vietnam and had similar experiences. John repaired helicopters and had to clean up gruesome remains. Thirty years later, the choppers still haunt him.

JOHN BOWLES: The sound of helicopters just never forget that sound.

GUPTA: John has been diagnosed with post traumatic stress disorder while his brother does not have the illness. And when you look at brain scans, there is a difference. John's hippocampus circled in red is 50 percent smaller on the right side, 15 percent smaller on the left.

Untreated, symptoms worsen over time. Professor Larry Cahill explains what happens in the brain.

LARRY CAHILL, Ph.D.,
UNIVERSITY OF CALIFORNIA,
IRVINE: In the time period right after a traumatic event, when the memory keeps popping into the person's mind, we know that each time it does, it's going to activate the body's stress hormone response and if we're right about stress hormones and memory, that stress hormone response should feed back to the brain and continue to strengthening the memory over these successive cycles in the weeks and months after a trauma.

GUPTA: Neural pathways get stronger, like a footpath being worn into the grass with repeated use. There's an intriguing possibility that drugs, taken after a traumatic event, might break the cycle. How? Because memory is like Jello. It doesn't set right away. Intervention after the initial event can either disrupt the process or help it along. One drug, propranolol (ph), was tested at Harvard. In that study, it reduced anxiety in sexual assault victims.

Think back to the ice water experiment. As stress went up, memory got stronger. Propranolol seems to have the opposite effect. Today, standard treatments for PTSD are anti-depressants and group and individual therapy. Lora's doctors say that by seeking and receiving treatment early on, his chance of recovery is excellent.

Research also backs up what several doctors and patients told us, social

support tends to help as much as anything.

LORA: (INAUDIBLE) the same guys you were in Iraq with and they say, hey, man, I'm having these problems and you open up, dude, let's get help. Let's go. The most painful thing for me is to sit in a room or go to drill and know that you're among heroes. That's my things. It's not painful. It's just painful because it's so joyful. I know people who are heroes, real life heroes and they're my friends.

GUPTA: With a wedding plan for June and two years left to a political science degree, this hero is putting his life back together. He's one of the lucky ones. We'll be right back with more on memory.

GUPTA: Many of us experience some weakening of memory in our mid 30s and by the time we're 65, nearly half of us complain of memory problems. So what's the best way to keep your mind young? We followed two people trying an unusual new prescription.

In here line of work, 53-year old Linda Jenkins spends practically all day talking and lately she's been hitting some blank spots, causing her a lot of anxiety.

LINDA JENKINS: I'll be talking along and all of a sudden - when that happens so often it calls attention, it is (INAUDIBLE) oh absolutely to me it is.

GUPTA: Then there's 64-year old Woody Fillhower (ph), who after more than 30 years in business has a penchant for numbers.

WOODY FILLHOWER: Put a dollar sign on, I remember them. If it doesn't have a dollar sign on it, I forget them.

GUPTA: But ask him to remember the name of a person he just met, even his employee's names, and you never know what he'll come with.

FILLHOWER: Like hey guy how you doing, instead of saying hey Joe, how you doing?

GUPTA: So Jenkins and Fillhower are trying an unusual program to fix their memory foibles. The first boot camp for the brain run by the Memory Fitness Institute in Fountain Valley, California.

The brains of the operation is Dr. Gary Small, the program, based on his book, "The Memory Prescription." He has spent his life trying to unravel the memory mystery. While admitting there are other factors, he says simple lifestyle changes can improve your memory in just 14 days.

DR. GARY SMALL: What can we do today to keep our brains healthy and fit and here it is, the big four: mental activity, physical conditioning, healthy diet and stress reduction, the key to memory fitness.

GUPTA: Before the boot camp, CNN asked an independent Florida-based firm called Psychologics to assess Woody and Linda's baseline memory of names, faces and numbers. We left with a promise to come back in two weeks when boot camp was done. Dr. Small

had said that it only takes that long to see a noticeable change.

Like Woody and Linda, millions of baby boomers are clamoring for a memory prescription. In a world where the drone of information is relentless and sometimes overwhelming. Business information guru Richard Wurman (ph) calculated that every day, the "New York Times" carries more information than a person in the 17th century took in in their entire lifetime. How can we possibly absorb it all?

Today, millions of us wade through that information glut with devices that help us remember and purported memory boosters like ginkgo biloba, vitamin E, even cumin. No large-scale studies have indicated a helpful effect from any of these. You'll be happy to hear that caffeine does help, but only in the short term.

Back at boot camp, Woody and Linda are already busy, first stocking up on healthy brain foods, rich in antioxidants and with plenty of omega-3 fatty acids which Small says may keep brain cells from degenerating. Some of his suggestions are blueberries, prunes, salmon and nuts. Another prescription, cut down on stress. That's a memory buster. Two other key elements of the program, exercise your body and your brain. Like zany story telling methods to remember lists of words.

UNIDENTIFIED FEMALE: The more fantastic or exaggerated you can make the picture, the easier it is to remember.

FILLHOWER: I had a lawyer wearing a vest, eating an artichoke and a banana.

GUPTA: Mindbenders or simply writing with your left hand if you're right handed, all are ways boot campers sharpen their brains during weekly meetings. Dr. Small's memory mantra.

SMALL: Look, snap, connect. Look reminds us to focus our attention. Snap and that means create a mental snapshot of the information and the final step is connect and that just helps us to remember to link together the mental snapshots in our mind's eyes.

GUPTA: After just a few days on the program.

FILLHOWER: I'm starting to remember more things than I used to, but I'm focusing more on what I'm doing.

GUPTA: But Linda is still having trouble finding words.

JENKINS: Especially for you know, like fruits and vegetables and things of that nature.

GUPTA: Neither one has stuck to the plan 100 percent but Dr. Small says even one lifestyle change could mean not only a better memory, but possibly delaying Alzheimer's disease.

SMALL: For example, eating fish once a week or just walking 10 minutes a day. If everybody did that and if all our assumptions were true, we would reduce the number of cases in the United States by a million in just five years.

UNIDENTIFIED MALE: I think those are helpful things, but whether they would give you complete protection is unlikely. It really depends on how strong the predisposition to Alzheimer's disease is.

GUPTA: Dr. Candell (ph) isn't the only skeptic about this type of program. But there are a few studies suggesting lifestyle does help. For example, researchers at the University of Illinois compared the brain of a physically fit 74-year old to a man the same age who was unfit. The healthy man's brain was bigger. It was just two people, but a study in the "Journal of the American Medical Association" found that brain stimulating activities like reading or doing crossword puzzles could reduce your risk of Alzheimer's.

SMALL: I think what's unique about our program is we're creating something that's practical, that people can use right now, while we're waiting all the detailed scientific evidence.

GUPTA: So I bet you're wondering how they did on that follow up memory test. After two weeks of boot camp, Woody's score improved overall.

FILLHOWER: I'm very pleased with the results. I plan to use a lot of the issues in the program for the rest of my life.

GUPTA: Remembering faces, Linda got better too, but when it came to name recognition and numbers, her scores actually went down. Still, like Woody, she says she plans to continue with the program.

JENKINS: I received a lot of tools in this program to help me. The different exercises that we went through in the class were very helpful and I think that that's something that I'm going to be able to use for a long time.

GUPTA: Hollywood is fascinated by memory loss. Movies like "Eternal Sunshine of the Spotless Mind," "Memento" and "50 First Dates" probably reflect our fears. 4 1/2 million Americans have Alzheimer's and the Alzheimer's Association says unless we can find more effective drugs, that number will triple by the middle of the century. But there is hope on the horizon.

Here in MIT's humanoid robotics lab, researchers create robots designed to move and respond like humans. Enter Charlie Kemp. Kemp has built a wearable computer he calls Duo, equipped with a backpack hard drive, head mounted camera and position sensors on his arm. Kemp is trying to program Duo to remember the way we do, to filter out the ordinary and file away what is new or different.

CHARLIE KEMP, MIT HUMANOID ROBOTICS GROUP: There's all this stuff that humans take for granted. It's the common sense, our every activities, our mundane existence is what machines have an incredibly difficult time with.

GUPTA: Some day, Kemp says a wearable computer might enhance your memory. For example, recognizing people you encounter and reminding you when you saw them last. Nearby at MIT's media lab, Sunil Vemuri has

designed a memory prosthesis. The wireless device attaches to his belt. It records all of his conversations, sends them to a computer and converts the recordings to text files. He can then search by keywords and dates.

SUNIL VEMURI, PH.D, MIT MEDIA LABORATORY: The eventual goal of all of this is to help with everyday memory problems.

GUPTA: Vemuri's memory prosthesis isn't something you can buy. It's only a prototype. So, if machines aren't ready to save us from memory problems, how about medicine? For people with Alzheimer's the FDA has already approved a handful of drugs. These medications offer a mild, but temporary improvement in memory. They are not able to stop the build up of plaques and tangles in the brain that result in progressively more profound memory loss. A new generation of drugs is on the way for Alzheimer's and other serious problems with memory, based on a better understanding of how memory works at a molecular level.

This is a giant green snail.

GUPTA: Much of that understanding can be traced back to this humble creature and the work of Dr. Eric Candell.

I realized to really understand learning and memory, one has to go to the simplest example and to begin with them and try to understand it.

GUPTA: Candell won the Nobel Prize for deciphering the chemical changes in

the marine snail's brain when memories are made. Candell co-founded Memory Pharmaceuticals in 1998 and the company now has two drugs in clinical trials for Alzheimer's and mild cognitive impairment.

Helicon Therapeutics, Cortex Pharmaceuticals and Sention Pharmaceuticals also have memory drugs in clinical trials. Even with the great advances in understanding and all

the research, an FDA approved memory drug is years away.

There's no miracle pill yet, but as we've seen, you can take basic steps to preserve, even improve your memory. I hope it's been a memorable hour. I'm Dr. Sanjay Gupta, thanks for watching. You can learn more about memory at cnn.com and don't forget to tune in for my next prime time special. It's on medical science that solves crimes. That's in May.