

Why MAOs Choose BrainHQ: Based on the Research Data

The BrainHQ brain health app has been offered to millions of Medicare Advantage (MA) members in recent years. This white paper outlines the reasons why BrainHQ has become a rapidly expanding MA benefit, chosen by leading national and by 5-star Medicare Advantage Organizations (e.g., Aetna, Elevance, Kaiser, Priority, Quartz, DeanAdvantage SummaCare), and the research data behind those reasons.

Overview

BrainHQ has been shown to offer MA and D-SNP plans three key benefits: better health outcomes, lower costs, and higher member engagement (both during open enrollment and throughout the year). Each of these three benefits are discussed below. But first a bit more about BrainHQ.

What is BrainHQ?

BrainHQ is a brain health app that monitors and improves brain function and health. BrainHQ is accessible on computers, phones, and tablets as a web app, Android app, and iOS app. Users are able to move seamlessly among their devices, and because each user's account is secured in the cloud, they can switch devices and just pick up wherever they left off.

BrainHQ contains dozens of brain exercises and assessments, as well as a voluminous library of information (text, graphic, auditory, and video) on activities that contribute to brain health (e.g., brain exercise, diet, physical exercise, sleep, relaxation, socialization).

A global team of university-based researchers have come together to design, test, refine, and validate the exercises in BrainHQ. That team is led by Dr. Michael Merzenich and includes more than 400 co-authors on more than 200 peer-reviewed papers on the efficacy of the exercises and assessment in BrainHQ.

Dr. Merzenich is the Co-founder of Posit Science, whose mission is to get the BrainHQ technology out into the world to everyone it can help. Dr. Merzenich has been awarded the Kavli Prize in Neuroscience (the highest honor in that field) for his body of work. He is the discoverer of lifelong brain plasticity – the ability of the brain to change chemically, physically, and functionally at any age. He also was the first to harness brain plasticity for human benefit, in his co-invention of the cochlear implant, for which he was awarded the Russ Prize in Bio-engineering by the National Academy of Engineering. He also has been elected to the National Academy of Sciences and the National Academy of Medicine.

After harnessing plasticity to make the cochlear implant, Dr. Merzenich turned to computerized training as a path to improve cognitive performance and brain health. That approach has now been validated in hundreds of peer-reviewed papers from the clinical trials discussed next.

BrainHQ Studies in Healthy (Mostly Older) Adults

There are more than 70 published studies in healthy older adults. They show that BrainHQ users get better at the exercises (as one would expect) – and that, crucially, those exercise gains translate into better cognitive performance, better performance at real-world activities, better quality of life, and better brain health. Some key examples follow:

Cognitive Performance

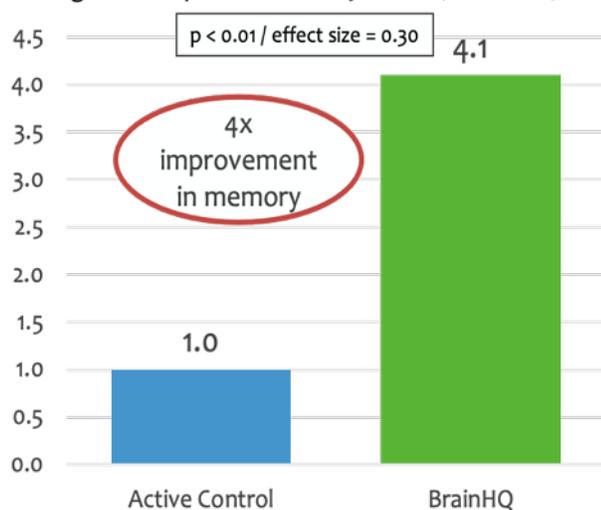
Numerous studies show gains in standard measures of cognitive performance, including various standard measures of brain processing speed¹⁻⁸, attention⁹⁻¹¹, memory^{4,7,12-16}, and executive function^{8,9,13,17} (planning, reasoning, and decision-making).

Example: The IMPACT Study⁴ was an early large-scale randomized controlled trial of BrainHQ exercises led by researchers at the Mayo Clinic and USC that confirmed the basic hypothesis behind how BrainHQ addresses cognitive aging. As explained in a review article in *Progress in Brain Research*¹⁸, the neuroplasticity-based approach behind the BrainHQ exercises addresses the normal slowing of brain processing speed and degradation of sensory accuracy that begins for most people in their late 20s or 30s and grows as they grow older. If information comes in quicker than it can be processed, or is processed with degraded accuracy, it becomes difficult to store, recall, or use. The IMPACT study posited that by improving speed and accuracy of the components of auditory processing (frequencies, formants, syllables, words, sentences, stories) through algorithm-driven progressively-challenging exercises, users would not just improve at the exercises, but also at processing speed, attention, and higher brain function (notably memory). In the 487-person IMPACT Study, the intervention group engaged in BrainHQ exercises and an active control group engaged in “new learning” which was a collection of computerized videos of great courses, followed by quizzes. The researchers found significant improvement in speed of processing in the BrainHQ group (compared to the control) as expected. Importantly, that translated into significant gains on standard measures of

IMPACT Study (Mayo Clinic, USC)

Enrolled 487 healthy adults age 65+

Change in composite memory score (index score points)



Equivalent to ~10 years of memory improvement

cognitive performance. The gain in memory was four times larger in the BrainHQ group than in the active control group. This magnitude of change is considered clinically significant, and was equivalent to the average decline on that measure that people experience in a decade – so that an 80-year-old was operating as though she was 70. In addition, users noticed the change in a standardized survey of everyday cognition, such as remembering names, where they left things, why they walked into a room, and what the doctor said.

Numerous studies have shown improvement in standard cognitive measures. More information can be found at: <https://www.brainhq.com/world-class-science/published-research>.

Quality of Life

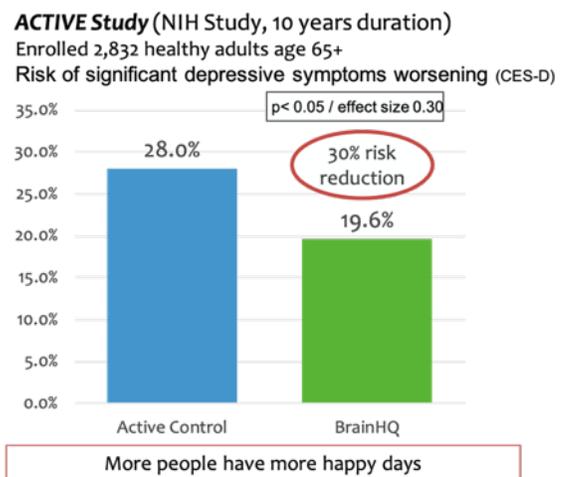
When a brain's speed and accuracy is improved by BrainHQ, it's not just measures of cognitive performance that improve. Numerous studies have shown that use of BrainHQ also improves many measures of quality of life – including mood and depressive symptoms^{19–21}, confidence and control²², health-related quality of life^{23–25}, and the ability to live independently^{2,3,21}.

Simply put, better speed and accuracy makes BrainHQ users feel more “with it” – confident and in a better mood. This is likely because BrainHQ is filled with elements designed to stimulate the neuro-modulatory system (which typically down-regulates with age) – including the exercises being attentionally-demanding (to stimulate acetylcholine), filled with novelty (to stimulate norepinephrine) and laden with rewards (to stimulate dopamine). This design is intended stimulate neuromodulators primarily because they enhance plasticity and learning, but they also positively affect mood.

Example: The ACTIVE Study was an NIH-funded 10-year study of more than 2,800 older adults using several cognitive training programs, including a group using exercises that now part of BrainHQ. The BrainHQ group showed a 30% lower risk of a serious worsening of depressive symptoms¹⁹ – and the result was unique to BrainHQ, with other cognitive training programs in the study showing no protective effects.

There are eight studies showing BrainHQ reduces depressive symptoms^{19–21,26–30}, including a study that found a 38 percent lower risk of onset of depressive symptoms²⁰ and a pair of studies in geriatric depression – one showing faster efficacy than Lexapro²⁶, and another showing efficacy among patients who had been resistant to prior drug therapies²⁸.

Numerous studies have shown improvement in standard measures of quality of life. More information can be found at: <https://www.brainhq.com/world-class-science/published-research>.



Real World Activities

BrainHQ also has been shown in numerous studies to improve real world activities. That includes several studies on gait, balance, and ambulatory mobility³¹⁻³⁴; many studies showing better performance at the complex and sometimes dangerous task of driving (including a 48% lower risk of at-fault crashes³⁵, fewer dangerous maneuvers³⁶, and a longer epoch of driving safely^{37,38}), listening^{7,14,39,40} (including in ways hearing aids cannot address, such as hearing in a noisy environments, processing rapid speech, or remembering what is said); as wells as better performance at measures of efficiency, safety and productivity in a variety of workplaces⁴¹⁻⁴³.

Example: This study³² on balance was conducted predominantly among African-American, community-dwelling, lower SES, older adults on the south side of Chicago looks at the impact of BrainHQ visual training on gait and balance. All participants at the beginning of the study were on the cusp of high-fall risk. The control group sees the kind of typical further degradation on might expect over the couple of months of the study, while the BrainHQ group is pulled back from the cusp of high risk. How does doing exercises while sitting at a computer improve gait and balance? Increased fall risk with aging is due to a number of factors – and a crucial one is that

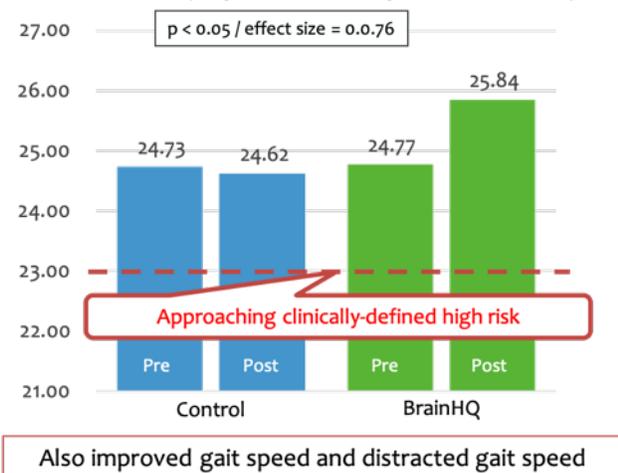
brain slowing and loss of accuracy in the visual system has significant effects on brain systems critical to balance. A slow and inaccurate visual system does not detect that visual signal that accompany the start of a fall – that the world is moving in a sudden direction – and down you go. BrainHQ visual exercises are designed (among other things) to strengthen those systems. A similar study in Chicago at a very high-end, largely Caucasian, retirement community, had similar results³¹. A much larger study (n=2,802) from the ACTIVE Study group, published in 2023, relied on self-report record of fall incidence over a 10-year period (after an initial 10 hours of training in the first five weeks). It found that those at high risk for falls (based on fall history) had a 31% lower fall risk over the 10-year period (based on actual fall incidence).⁹⁴

BrainHQ Studies in Clinical Indications

While the prior section discusses the 70+ studies in healthy (mostly older) adults, more than 150 studies of BrainHQ are now in people with a variety of clinical indications. BrainHQ has been shown to improve cognitive performance and deliver other benefits in: neurodegenerative diseases (e.g., dementia prevention⁴⁴, Mild Cognitive Impairment^{45-49,13,50-58}, Multiple Sclerosis^{59,60}); Brain Injuries (e.g., stroke^{61,62}, traumatic brain injuries⁶³⁻⁶⁷, chemobrain associated with cancer⁶⁸⁻⁷⁰, cardiobrain associated with heart failure⁷¹⁻⁷³, and HIV-associated neurological disease⁷⁴⁻⁷⁷); and mental illness (e.g., depression^{26,28}, schizophrenia⁷⁸⁻⁸¹, bipolar disorder⁸²). A list

Chicago Study (NIH Study)

Enrolled 45 adults with a fall history age 65+
Balance Score (Berg Balance Scale, higher scores are better)



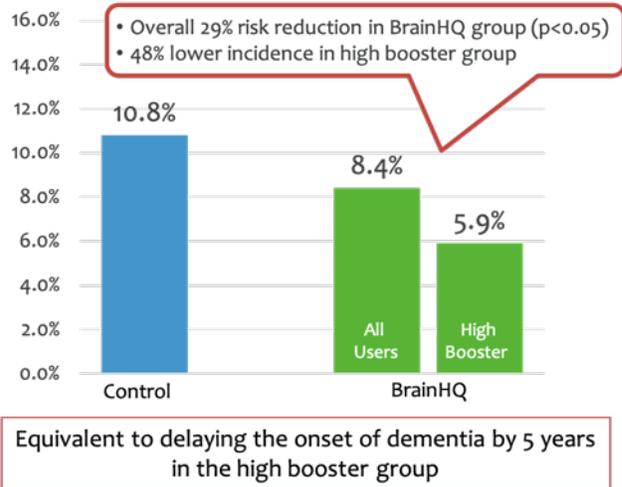
of studies by indication can be found at <https://www.brainhq.com/world-class-science/information-researchers>.

BrainHQ also has been shown in numerous studies to improve fundamental measures of brain health, including the speed, accuracy, and strength of neural responses^{15,50,51}, the integrity of the insulation that surrounds neural connections⁸³, and the functional connectivity between disparate regions of the brain^{52,81}. Improving basic measures of brain health in this manner may make the brain more resilient and able to maintain healthy brain function over time.

Example: BrainHQ is the first intervention of any kind (pharmacological or behavioral) shown to reduce the risk and incidence of dementia in a large randomized controlled trial. The ACTIVE Study reported on results from an NIH-funded 10-year study of 2,800 older adults. They found a 29 percent reduction in the risk of dementia among participants who did just 10-18 hours of BrainHQ training⁴⁴ (including 10-14 hours in the first year, and an additional 4 hours in the third year). The subgroup who did the most training – those 4 extra hours in the third year of the study – showed an up to 48% reduction in dementia incidence.

ACTIVE Study (NIH Study, 10 years duration)

Enrolled 2,832 healthy adults age 65+
10-year incidence of dementia diagnosis



A recent study in Australia made use of BrainHQ and reported lower Alzheimer’s risk⁵⁵. BrainHQ is now the cognitive training component of further studies on dementia prevention being conducted in Latin America, Europe, Australia, and Asia. NIH announced a \$43 million grant in March 2021 to determine if researchers can replicate the results in the ACTIVE study in preventing a diagnosis of Alzheimer’s or other forms of dementia, and also to measure the impact of BrainHQ training on MCI. An additional \$24 million grant from the NIA to the Active Mind Study for a similar investigation was made in 2022.

Research on BrainHQ Cost Savings

A number of studies have found that BrainHQ impacts health outcomes in ways that could reduce healthcare costs. Here are three examples:

Population Health (AHRQ Model)

BrainHQ has been shown to improve overall health-related quality of life, which in turn reduces total predicted medical expenditures by ~3.3%⁸⁴. This study used the AHRQ Model developed for DHHS. Participants received an average of just 10 hours of BrainHQ training in the beginning of the first year and were tracked for five years. The researchers found a 3.3-3.5 percent (330 to

350 basis points) reduction in year one, which is equal to about \$450 per person in 2020 dollars. They found that the savings persisted, but diminished, over the following four years, with no further training.

Population Health: Dementia Prevention Savings

Economic modeling from the Alzheimer’s Association shows that a treatment that slowed dementia onset by five years - about the amount shown in the ACTIVE Study – would reduce Medicare costs by ~\$690 per person per year⁸⁵.

Clinical Care Savings

Studies in heart failure show improvement in cognitive abilities, improvement in a critical measure of physical performance for this indication (the 6-Minute Walk Test), and improvements in standard measures of self-care management and maintenance⁸⁶. A study from Indiana University found a trend of about a 50 percent reduction in healthcare costs – largely driven by reduced re-hospitalizations⁷².

Research on BrainHQ User Engagement

The top concern of older adults is cognitive health. When they surveyed members on their concerns, AARP found the highest ranking concern among older adults was about brain health – outranking saving Social Security or saving Medicare, which had previously been the top concerns⁸⁷. The next year, AARP surveyed members about what kind of programs in brain health most interested them; 84 percent were interested in validated brain exercise and 39 percent were interested in brain health information. BrainHQ provides both.

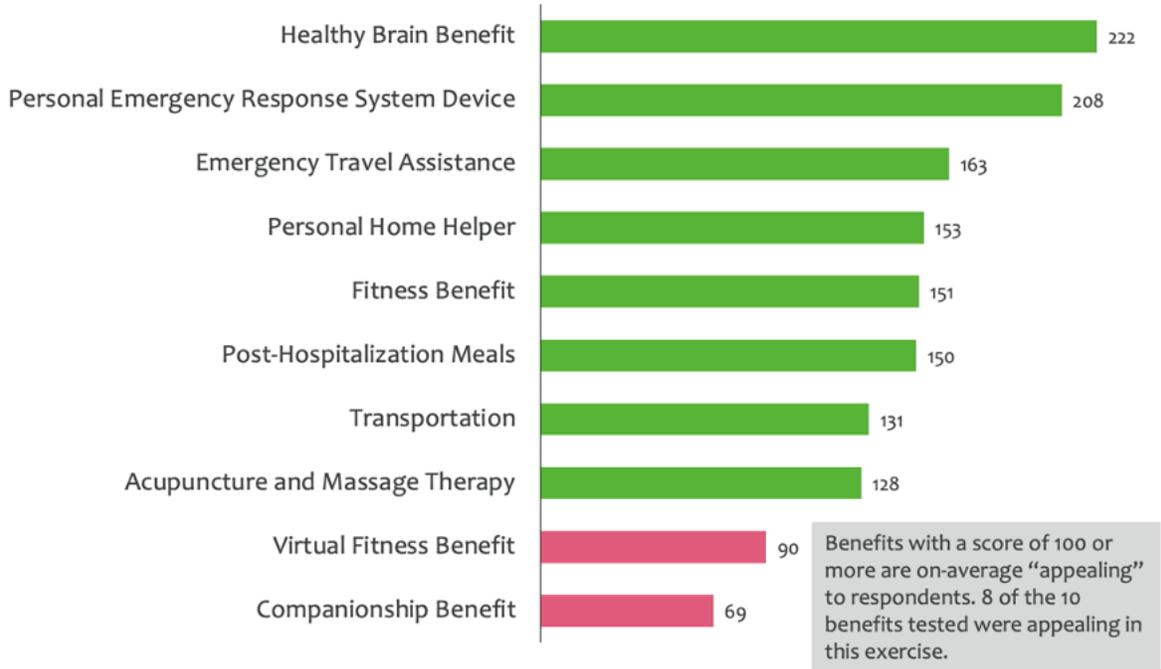
NMI found that brain health was the number 1 health concern of mature adults – outranking heart health⁸⁸.

A recent report from Deft Research — on which new benefits were mentioned by MA members who switched health plans for 2021 — found that brain exercise was among the top benefits cited⁸⁹.

In sponsored research first presented in January of 2023, Deft Research announced further survey results about the attitudes of Medicare members and age-ins toward supplemental benefits and toward brain health. Among the findings were the following:

- 91% believe brain health is as or more important than physical health
- 96% say health plans offering physical fitness benefits should offer brain fitness
- 85% have interest in using a brain benefit, with 34% extremely/very interested
- interest is even higher among age-ins and plan shoppers
- A brain fitness benefit was the #1 pick of those surveyed (from 10 popular benefits)

A Healthy Brain Benefit Was the Single Most Preferred Benefit Tested in This Survey



In work with plans across the past four annual enrollment periods (AEP), BrainHQ heard from “war rooms” that the “mind-body” messaging of BrainHQ really resonated with this cohort — possibly because that “mind-body” ideal from classical education was in vogue in their youth, or because it gave older prospects permission to chat about this oft-unspoken concern about age-related cognitive decline. Member surveys also indicated that brain fitness made “inherent sense” and offering indicated an interest by the plan in the “whole person” and “total health.”

BrainHQ maintains an Engagement Ratio (DAU/MAU, a social-gaming industry measure of engagement) comparable to those of successful online games, with active users engaging 2-3 times per week for 20-30 minutes per session on average.

While average take rates vary, based on how much plans make members aware of the benefit, typically, a plan usage rates are comparable to the gym benefits they may offer. Unlike gym benefits, BrainHQ does not require members to go somewhere to utilize the benefit.

CMS data analyzed by Faegre Drinker showed that a brain health benefit (or in CMS language a “memory fitness benefit”) is the largest of CMS fast-growing supplemental benefits, and the relatively new benefit category is now offered by one out of four plans offering a gym benefit. <https://www.faegredrinker.com/en/insights/publications/2022/11/2023-preventive-supplemental-benefit-landscape-in-medicare-advantage-insight-into-a-competitive-mark>

As noted in the studies on depressive symptoms and confidence and control, BrainHQ is apt to improve the overall mood and happiness of members, which can have an impact on consumer survey about plans (such as star ratings). Members tend to credit their plans for offering a benefit that promotes total health and that personalizes to each member. In surveys of users at MA plans 64 percent indicated that BrainHQ availability is somewhat, very, or extremely important in choosing next year's plan, and 78 percent reported that BrainHQ is as or more important than a physical fitness benefit.

A Shift in the Conventional Wisdom

CMS is Right on Trend

CMS was not acting in a vacuum when it decided to permit brain exercise programs as a supplemental benefit that can be offered broadly across the MA population (much like a gym benefit).

In the past six years, there has been a sea change among thought leaders about the value of computerized brain exercise programs, based in large part, on studies of BrainHQ.



In 2015, the Alzheimer's Association found that cognitive training should be added to its list of lifestyle changes that could reduce the risk of cognitive decline⁹⁰.



In 2017, the National Academies of Sciences, Engineering, and Medicine published a comprehensive report looking at the evidence behind dozens of possible interventions that might affect cognitive aging, and they found they could suggest just three to people who want to be proactive about their brain health: brain training, physical exercise, and if you have high blood pressure, take hypertension medications⁹¹.



In 2017, in new clinical guidance on the treatment of patients with Mild Cognitive Impairment (MCI, the American Academy of Neurology recommended that patients should not use Alzheimer's drugs, but should engage in cognitive training⁹².



In 2019, the World Health Organization went further and determined cognitive training may be offered to older adults with normal cognition or with mild cognitive impairment to reduce the risk of cognitive decline and dementia.⁹³

Other Thought Leaders and BrainHQ

MAOs that choose BrainHQ are in good company, BrainHQ has been selected by:



The multi-modal US Pointer Trial funded by the Alzheimer's Association which chose BrainHQ for its cognitive component, as have similar trials aimed at protecting against cognitive decline. in Europe Asia, Latin America, and Australia.



The lead investigators at all four large dementia trials examining behavioral interventions recently funded by NIH, who chose BrainHQ for their trials. In referencing the BrainHQ exercises, an NIA website notes “...Posit Science training drives improvements that are significantly better than any other type of cognitive training.”



The Mayo Clinic who chose BrainHQ, as the brain training element of its HABILIT program for pre-dementia patients, as have similar programs at the Cleveland Clinic, Muse Labs, the Bredesen Protocol and The Brain Health & Research Center.



The AAA Foundation, Clubs and Insurers who have worked with BrainHQ for more than a decade improving driving safety and reducing crashes among seniors. AAA reported a 30 percent reduction in crash claims as a result of training.



The Prospect Development Program of USA Baseball/Major League Baseball, for the cognitive evaluation and performance improvement of all 800 prospects invited each year to try out for Major League Baseball.



The Department of Defense who purchased BrainHQ as the only brain training ever made available to every soldier, sailor, airman, and marine. BrainHQ is used both to train service members for peak performance and to treat brain injuries.



The US Special Operations Command (SOCCOM), which selected BrainHQ as the brain training program for special forces (Green Berets, Seals, Rangers, Raiders, Delta Force, etc.) to help top performers be even better at what they do.



NASA, whose research scientists know that space travel is tough on the brain (from g-forces, weightlessness, and isolation). As NASA contemplates a return to the moon and travel on to Mars, it is looking at BrainHQ as a possible means for building abilities and resilience among astronauts. Results from a small pilot, published in 2023, showed a 19% gain of the NASA Cognition Test Battery.⁹⁵



Reviewers from five Alzheimer’s Institutes, writing in *Neuropsychology Review*, which published the only comprehensive review of brain exercises and brain games targeting older results, and which found most brain exercise or games had no evidence of efficacy, and only one — BrainHQ — was backed by multiple high-quality studies⁹⁴.

Further Information

Just in 2022, more than 70 journal articles about BrainHQ were published, so it can be a challenge to keep up to date on BrainHQ research. There is a comprehensive listing of BrainHQ studies in healthy adults and in clinical populations at <https://www.brainhq.com/world-class->

[science/information-researchers](#). To try BrainHQ, register at www.brainhq.com at no cost and receive limited access to one exercise per day and a free subscription to the monthly Brain Fitness News e-newsletter. To receive complimentary full access to BrainHQ and the quarterly medical science newsletter distribution, or to discuss research opportunities, please write to research-info@brainhq.com

Citations

These footnotes include more than 90 journal articles about BrainHQ exercises; however, there are more than 200 journal articles. More recent articles tend to identify BrainHQ exercises as from BrainHQ, but earlier articles may identify the exercises under our company name Posit Science or under the monikers “speed of processing training” “SOP training,” or “speed training.” There is a more comprehensive listing of BrainHQ studies at <https://www.brainhq.com/world-class-science/information-researchers>. With 59 articles published in 2020, and about 300 studies in progress at the time this white paper was written, please inquire if there is an area of interest not listed. There may well be an article on that topic, or a study underway.

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