

Video Game Technology for Mobility and Cognition



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INFOCORNER



What is NARCOMS?

NARCOMS is a registry for people who have multiple sclerosis (MS). Registry participants complete two surveys each year to provide information about themselves and their experience living with MS. Data from these surveys are used in research studies and to help further our understanding of MS. Participation in the registry is voluntary, and responders' identity and privacy are carefully secured.



What is the Goal of NARCOMS?

The NARCOMS Global MS Patient Registry helps to facilitate research about multiple sclerosis in North America and around the world. Collaboration between MS centers of excellence throughout the world helps to increase knowledge, improve clinical care, and enhance the quality of life for persons with MS.



How Private Is My Information?

We will keep the information that you provide us private and confidential by storing your data in a secure database. All information will be used for research purposes only. We do not share any personally identifying information with any person or research institution. We follow all Federal (HIPAA) laws regarding confidentiality.



Not Yet a NARCOMS Participant?

Please contact us at www.NARCOMS.org to enroll online, or call toll free at 1-800-253-7884.



Tell Us Your Thoughts!

Have an idea? We would love to hear from you!
Send us your questions, comments, and suggestions.

Email: MSRegistry@narcoms.org

Online: www.narcoms.org/contact-us

Call: 1-800-253-7884 (toll-free U.S.)

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DIRECTOR'S LETTER

Dear NARCOMS Now Readers:

In this issue of *NARCOMS Now*, we focus on advances in the development of wearable devices and telehealth, and how these advances may affect people with MS. Both of these technologies can increase communication and access between clinicians and patients, and support MS research.



Ruth Ann Marrie, MD, PhD

In the Feature Focus, we examine the efforts of Dr. Riley Bove (Associate Professor of Neurology at the University of California-San Francisco) to develop digital resources to assess and treat cognitive impairments that affect people with MS. In addition, we feature a Q&A with Robert Motl, PhD (Professor at University of Illinois Chicago) who explains the science behind wheelchair workouts.

In the SnapShot, we examine a recent report about access to and use of telehealth by NARCOMS participants. This report summarizes responses from the NARCOMS fall 2020 survey.

In the MS News sections, we review a recent report about the association of the Epstein-Barr virus with the risk of developing MS. We also describe a study examining the use of smartphone apps in measuring disability in people with MS. In addition, we discuss the lack of effective treatments for progressive forms of MS with Dr. Robert Fox, Vice-Chair for Research at the Cleveland Clinic Neurological Institute, who delivered the Kurtzke Memorial Lecture at the 2021 Consortium of Multiple Sclerosis Centers (CMSC) Annual Meeting. Finally, we report a study using remote monitoring of step counts to measure disability progression in adults with MS.

Your continued participation in the NARCOMS registry is critical in advancing our knowledge of MS. We thank you for your effort and contribution to MS research.

Sincerely,

Ruth Ann Marrie, MD, PhD
Scientific Director, NARCOMS



FEATURE FOCUS

Game On! Video Game Technology May Help Assess and Improve Cognitive Skills in MS

Video games can be fun and often quite engaging. However, not all video games are simply an enjoyable way to pass the time. Specially designed video games may serve as tools to measure and even sharpen a person's mental abilities. A team of researchers from the University of California San Francisco (UCSF) is using special video games to rethink how cognitive function can be assessed in people with multiple sclerosis (MS).

"Cognitive impairment affects 30% to 70% of people with MS. This can be one of the most debilitating aspects of the disease," said neurologist Riley Bove, MD, the study's lead investigator. "Detecting cognitive impairment early is essential to help our patients with MS navigate problems in their daily lives and, when possible, to prevent further decline," Dr. Bove said. However, getting a neuropsychological evaluation can be time-consuming, tiring, and expensive. Many people with MS do not have easy access to professional testing. "Using video game-based technology may help to provide information about a person's cognitive function that might otherwise be hard to obtain," Dr. Bove explained.

USCF scientists have pioneered research into whether gaming technology can enhance

cognition in certain groups. These include older adults, children with attention problems, and those with neurologic diseases like MS (see sidebar). For this study, Dr. Bove's team recruited 100 adults from their MS clinic and 24 control participants without MS. Standard cognitive tests such as the Symbol Digit Modalities Test (SDMT) and other neurologic tests were administered. Among the 100 participants with MS, 33 showed evidence of cognitive impairment and 67 did not.

Study participants were taught how to play the video game EVO Monitor, created at UCSF to hone cognitive skills such as attention and multitasking. UCSF researcher Joaquin Anguera, PhD, explains: "This technology targets brain networks associated with a person's ability to focus and to deal with distractions." For part of the game, the user must navigate a character along a moving roadway while avoiding obstacles. In other parts, the user has to respond quickly to certain cues as they pop up, while ignoring other cues. The games were played on tablet devices that the participants took home. The devices captured information about how well the participants performed in the game and how well they learned the game over time.

In a paper published in the *Journal of Medical Internet Research*, the authors showed that performance in the game could distinguish between people with MS who did and did not have cognitive impairment through changes in certain areas or “domains” of cognition over time. Interestingly, the results of the game play were similar to those obtained using the standard cognitive tests. This suggests that newer game-based approaches might supplement or even replace some traditional neuropsychological tests in the future. In addition, participants with MS enjoyed playing the game and stuck with it through the course of the study.

In addition to using games for testing, there is hope that, over time, specially designed games could help the user to improve skills such as multitasking and focus. However, any benefits most likely depend on 1) the game being played, and 2) the improvements an individual is expecting. “Our research suggests that mixing and matching games won’t work,” Dr. Anguera explained, “There are specific qualities of this intervention that are distinct from commercially available games. One area of difference is that most participants feel fatigued after playing this game for about 25 minutes, unlike most off-the-shelf games.”

Too little is known about the science of video game technology to know whether these games provide benefits in brain function. But ongoing research seems to point in the direction of potential benefit, targeted for the person’s individual needs, with an element of fun.

GAME CHANGERS

Neuroscience researchers are redesigning video games as “brain training” tools. These specially designed games are fun and may help to address cognitive issues in areas such as attention and memory.

ADAM GAZZELEY LAB AT UCSF



Dr. Gazzaley is a pioneer in using video games as tools for cognitive study and training. Scientists in the lab have many ongoing studies in the works with multiple games. A few examples are shown here.

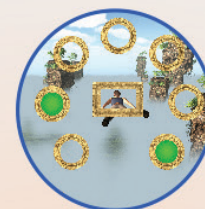


NEURORACER

One of the earliest games developed at the lab, this game challenges users to respond quickly and accurately to help with distractions and multitasking.

BEEP SEEKER

This game helps users learn to better ignore distractions and “filter” distracting information.



BODY BRAIN TRAINER

Full-body “motion capture” game measures heart rate while challenging cognitive abilities. An action-adventure storyline keeps participants engaged.

How well do these games work?

- The science of using game technology for brain training is still in its infancy.
- A 2014 expert consensus paper on the “brain training industry” said that evidence is limited on how well these techniques work.
- In 2020, the FDA approved EndeavorRX, a digital treatment for children with ADHD. This marked the first approval of a “prescription” game-based treatment.



The Science Behind Wheelchair Workouts

Q&A with Robert Motl, PhD

Dr. Motl is currently Professor of Kinesiology and Nutrition at the University of Illinois Chicago. He is a recognized expert on exercise therapy for people with MS. NARCOMS Now spoke with Dr. Motl about his research on exercise programs for people with MS who use wheelchairs.

Q How unique are studies on exercise for people in wheelchairs?

A There are very few studies on exercise involving people with MS who use wheelchairs. The studies available have focused on assisted exercise training. An example of this concept might be a cycling exercise aided with electrical nerve stimulation. Another example might be walking on a treadmill while the body weight is supported in a harness.

So far, findings from these studies are very limited. People with MS have many different reasons for using a wheelchair for mobility. These include fatigue, spasticity, and gait problems, among others. Most previous studies do not adequately consider the full disability spectrum of MS. We hope to learn more with our current research.

Q What are some types of exercise training that wheelchair users can try?

A When we discuss exercise training in this group, we must consider novel modes of

exercise. This might include arm cycling (similar to regular cycling except the arms are used to pedal) or resistance training using bands or Velcro type weights (see Box, Wheelchair Exercise Resources).

Q It seems that many people associate wheelchair exercise with competitive "Paralympics" types of sports. How can this idea be translated to the average person?

A This is a lot of publicity surrounding competitive sports for wheelchair users. But the average person should have options for engaging in non-sports physical activities. For some, this might mean finding ways to be active in their home environment. Some communities offer chair yoga or wheelchair dance programs. There are resources online to find exercises that can be done at home using simple devices like bands or light hand weights. We need to ensure that wheelchair users have the tools and knowledge they need to implement a program that's right for them, just like someone who does not use a wheelchair.

Q What do you tell patients about the degree of change they can achieve by doing specific exercises in the chair?

A This is still a great unknown. One would expect many of the same benefits that non-wheelchair users can achieve, but we really need more science to guide us. For example, we do know that exercise programs for non-wheelchair users can offer substantial disease management benefits in MS. We don't know yet whether wheelchair users with MS can do enough exercise to achieve these same benefits. We are optimistic, however, that we can design such a program by adapting existing exercise approaches.



For More Information

Dr. Motl's research on wheelchair exercise includes the following papers in medical journals.

- Silveira SL, Froehlich-Grobe K, Motl RW. Developing a community-engaged wheelchair exercise program for persons with MS: community advisory board formation and feedback. *Disabil Rehabil Assist Technol.* 2021 Dec 10:1-8.
- Silveira SL, Richardson EV, Motl RW. Informing the design of exercise programs for persons with multiple sclerosis who use wheelchairs: a qualitative inquiry of perceived components. *Disabil Rehabil.* 2021 Jun;43(13):1838-1848.
- Rice IM, Jeng B, Silveira SL, Motl RW. Push-rate threshold for physical activity intensity in persons who use manual wheelchairs. *Am J Phys Med Rehabil.* 2021 Mar 1;100(3):292-296.

Wheelchair Exercise Resources Online



UK MS Society Wheelchair Exercise Video

Search: Youtube/MS Active Together Series/Move More With MS

SpecialStrong. Top 10 Exercises for People in Wheelchairs

<https://www.specialstrong.com/exercises-for-people-in-wheelchairs/>



SNAPSHOT

WHAT WE CAN LEARN FROM NARCOMS SURVEYS

Use of Telehealth by People with MS

Participant responses to NARCOMS surveys can highlight effective methods for the delivery of healthcare or health education for persons with multiple sclerosis (MS), as well as participant preferences in the delivery of those methods. About 6 months into the COVID-19 pandemic, the Fall 2020 NARCOMS survey included questions about telehealth. These questions related to participant access and preferences in using electronic means of exchanging healthcare information, use of telehealth videoconferencing with healthcare providers, and satisfaction with the telehealth experience. The Telehealth Usability Questionnaire (TUQ)¹ was used to evaluate the usability of telehealth in the NARCOMS participant community. The TUQ was developed for use by clinicians and patients to evaluate specific usability factors of different telehealth videoconferencing systems. The factors that the TUQ assesses include usefulness, ease of use, effectiveness, reliability, and satisfaction. The TUQ is an effective measure of the usability of telehealth methods in healthcare delivery.

A very recent publication in the journal *Neurology: Clinical Practice* used data collected in NARCOM's Fall 2020 Survey to assess the availability and usability of telehealth among persons with MS². The NARCOMS team wanted to ask two questions. First, is access

to telehealth care related to levels of income and education? Second, do people with MS who report greater impairments in vision, cognition or hand function find it harder to use videoconferencing?

The Fall 2020 survey was completed by 6043 (71.6%) NARCOMS participants. Overall, 5403 (89.4%) participants also met the specific inclusion criteria of the study. Responders to the survey were mostly White (87.8%), female (80.6%), with post-secondary education (74.1%) and an income greater than \$50,000/year (45.2%). Most participants reported interest in using electronic means to exchange test results electronically, receive appointment reminders, and diagnostic information. Much less interest was reported for using electronic means to convey general health tips, lifestyle behavior suggestions, or reminders to take medications.

While interest by participants in telehealth was high, 53.5% of participants reported access to telehealth. Only 39.1% of participants reporting receiving telehealth and 28.2% reporting using telehealth videoconferencing. Of participants reporting access to telehealth, most were of younger age and had a post-secondary education, annual income greater than \$50,000/year, increased comorbidities, greater mobility symptoms, and greater physical activity. Moderate to very severe

vision symptoms were associated with a lower likelihood of receiving MS care via videoconference than mild vision symptoms.

Overall, participants who used videoconferencing reported it was highly usable based on the TUQ. However, perceived usability of videoconferencing varied across participant groups. Older participants and those with moderate to very severe vision symptoms reported a lower telehealth usability. Those with incomes greater than \$50,000/year reported greater telehealth usability. Participants living in an isolated rural town perceived a greater usability of telehealth.

These findings regarding age and income related to access and usability of telehealth are consistent findings in the general population.³

The use of NARCOMS survey data to assess telehealth use in people with MS provides a large sample size with the ability to account for participant sociodemographic factors, clinical characteristics, and health behaviors. However, participants who responded to the

survey showed differences in race, education, and disability from participants who did not respond to the survey. The experiences and views of NARCOMS participants may not represent the views of all people with MS.

The study did not address whether the use of telehealth is medically effective. While telehealth can reduce health care barriers because it is convenient and reduces travel costs and burden. However, it may increase health care barriers and disparities for some individuals. The study findings suggest that healthcare providers should strive to reduce barriers to telehealth for people with MS who are older, with lower incomes, and express greater disability.

References

1. Parmanto B, Lewis AN, Jr., Graham KM, Bertolet MH. Development of the Telehealth Usability Questionnaire (TUQ). *Int J Telerehabil* 2016;8:3-10.
2. Marrie RA, Kosowan L, Cutter G, Fox R, Salter A. Disparities in Telehealth Care in Multiple Sclerosis. *Neurology: Clinical Practice*. 2022 doi: 10.1212/cpj.0000000000001167.
3. Eberly LA, Kallan MJ, Julien HM, et al. Patient Characteristics Associated With Telemedicine Access for Primary and Specialty Ambulatory Care During the COVID-19 Pandemic. *JAMA Network Open* 2020;3:e2031640-e2031640.





A Study of Over 10 Million Active and Reserve Military Personnel Show Epstein Barr Virus as the Most Likely Cause of MS

Infection with the common Epstein-Barr virus (EBV) appears to be a key factor determining whether a person does or does not develop multiple sclerosis (MS), a new study reported. While EBV has long been implicated in MS, factors such as genetic makeup, environment, and lifestyle habits (e.g., smoking) seem to increase the likelihood of MS. However, this new research indicates that MS is very unlikely to occur if EBV is not already taking up residence in the body.

A group of Harvard University epidemiologists, including Drs. Cassandra Munger and Alberto Ascherio, used a database that included more than 10 million young adults on active duty in the U.S. military to assess the relationship between EBV infection and the incidence of MS. In these young men and women, blood samples were drawn when most were under age 20 years. Leftover blood was available from some samples for research.

In total, 955 people were diagnosed with MS during their military service. Of those, 801 had their blood tested for antibodies to EBV. EBV antibodies were present in all but one of those tested. Some experts suggest that this single case could have been due to a sampling error and that the person probably did have

EBV. Alternatively, the diagnosis of MS in that person could have been incorrect. It is also possible that EBV accounts for most, but not all cases of MS. It is also possible that EBV accounts for most, but not all cases of MS. At the time of enrollment in the military, 35 of the people later diagnosed with MS had not been exposed to EBV. Similarly 107 people who were not diagnosed with MS ('controls') had not been exposed to EBV. Of the 35 people, 34 later tested positive for EBV, and were subsequently diagnosed with MS. Slightly more than half of the controls later tested positive for EBV.



These results suggest that MS does not occur, or very rarely occurs, in the absence of EBV. "These findings cannot be explained by any known risk factor for MS and suggest EBV as the leading cause of MS," the investigators stated. "Causality implies that some individuals who developed MS after EBV infection would not have developed MS if they had not been infected with EBV."

EBV, a type of herpesvirus, is associated with a disease called mononucleosis, or "infectious

mono.” EBV is a benign infection in most people so not everyone who is exposed develops mono, although we continue to carry the virus in our bodies. Only a small percentage of people who contract EBV will later develop MS. EBV is present in about 95% of adults in the U.S., while MS remains a relatively rare disease. However, the Harvard study showed that the risk of MS increased by 32-fold after the person was infected with EBV.

We still do not know exactly what triggers the start of MS after the infection with this virus. Testing for a similar virus, cytomegalovirus (CMV), was also performed in some of the samples. Lower rates of MS were found in people who tested positive for CMV. This confirmed previous findings suggesting that these viruses work against each other and CMV may have a protective effect against MS.

These findings support those of other EBV research in MS. They suggest that using certain antiviral drugs active against EBV may represent a promising target for new MS treatments. For those not yet exposed to EBV, prevention of the infection with antivirals or vaccines could potentially represent a path to preventing MS.

Reference

Bjornevik K, Cortese M, Healy BC, et al. Longitudinal analysis reveals high prevalence of Epstein-Barr virus associated with multiple sclerosis. *Science*. 2022 Jan 21;375(6578):296-301.

Wearable Step Counters Can Detect Gait Issues in Multiple Sclerosis

The step counter app on a wristwatch-type device can be a good way to track daily physical activity. Researchers from the



University of California San Francisco (UCSF) wanted to find out if measuring step counts over a long period could provide information about disability progression in people with multiple sclerosis (MS).

The researchers first tested the idea by asking people with MS to wear a “Fitbit” accelerometer for 4 weeks. These devices are worn on the wrist and track the number of steps the wearer has taken. UCSF physical therapist Valerie Block and her colleagues then recruited 95 people with MS to wear these devices for one year. Of the 95 people, 79 completed the study. Their results suggest that a step counter could provide information about MS disability that is not picked up by other methods. Among the findings:

- Compared to subjects with higher step counts, those participants who had a lower step count at the start of the study had an increased risk of clinical disease worsening at one year.
- Having the step count decline over the course of the year was associated with worse clinician-assessed and patient-reported MS outcomes. This was shown even when standard MS assessments such as Expanded Disability Status Scale (EDSS) and timed 25-foot walk remained stable.

“Using wearable accelerometers records how much a person actually moves in his or her daily life,” the authors reported. “Measuring average daily step count could be relevant for targeted intervention in controlled trials as well as in clinical practice in MS and other neurologic disorders.”

Reference

Block VJ, Bove R, Zhao C, et al. Association of continuous assessment of step count by remote monitoring with disability progression among adults with multiple sclerosis. *JAMA Netw Open*. 2019 Mar 1;2(3):e190570.

What’s the Latest in Progressive MS? NARCOMS Managing Director Provides Updates for MS Clinicians

The limited treatments for progressive forms of multiple sclerosis (MS) remains a major unmet need. In his Kurtzke Memorial Lecture at the 2021 Consortium of Multiple Sclerosis Centers (CMSC) Annual Meeting, Robert J. Fox, MD, discussed the latest findings on progressive MS and progress towards new therapies. Dr. Fox is Vice-Chair for Research at the Cleveland Clinic Neurological Institute, a staff neurologist at its Mellen Center for MS. Dr. Fox serves as the Managing Director of NARCOMS and is known for his work in progressive MS.

The definition of progressive MS has been updated in recent years, Dr. Fox noted. Instead of just determining whether a person is having clinical relapses, the newer approach assesses the presence or absence of active inflammation, which is captured by both clinical relapses and new lesions (or scars) on MRI. There is also new thinking about when

these phases occur. While we used to think of relapsing MS as being an initial phase and progressive MS as happening later, these changes in the brain are now thought to overlap in many cases. “MRI is not as helpful in detecting or monitoring progressive changes as it is in identifying focal inflammation,” Dr. Fox added. “A recent consensus statement concluded that reliable MRI indicators for either secondary progressive or primary progressive MS are still lacking.”

Much collaborative research has been launched in the past decade to find new treatments for progressive MS. “We still don’t know what types of cells are the true drivers of progressive MS,” Dr. Fox noted. “Many active research studies are seeking to target the sources of ongoing cell damage.” He presented a list of several new agents currently under investigation. In addition, he summarized a variety of potential therapies that are being studied in progressive disease. Some of the trials recently completed or currently underway include:

Phase 3

- Bruton’s tyrosine kinase (BTK) inhibitors
- Simvastatin, a drug used to lower cholesterol
- Masitinib, a drug used in cancer treatment

Phase 2

- Ibudilast
- Lipoic acid
- Domperidone
- Estriol
- Quetiapine

What about stem cells? “This is a common question we hear in the clinic,” Dr. Fox said. Mesenchymal stem cell research is of particular interest in progressive MS, he said. This type of stem cell treatment differs from the “bone marrow transplant,” in which stem cells are removed and then replaced in an effort to reboot the immune system. With the mesenchymal approach, a person’s own stems cells are manipulated using certain drugs that they believe might help to promote repair. Researchers are using advanced research methods to test thousands of drug therapies simultaneously in the laboratory in an effort to identify ones that might warrant further study. Dr. Fox also chairs the Scientific Steering Committee of the International Progressive MS Alliance, an organization with a major role in guiding progressive MS research. “With the robust pipeline and new ways of looking at this phase of the disease, hope for progressive MS is on the horizon,” Dr. Fox concluded.

Some MS Neurologic Testing May Be as Close as Your Smartphone

Smartphones and other devices may eventually take the place of pen-and-paper tests for measuring certain neurologic functions. A group of researchers from the National Institutes of Health (NIH) studied a specially designed smartphone app in a group of people with multiple sclerosis (MS). They wanted to see if the app can provide information about cognitive and motor function in MS.

For the study, 112 people with MS were recruited along with 15 people without MS. The participants were shown how to play a “Level Test” game on a smartphone. Users were asked to tilt the smartphone to get a free-rolling ball into the center of the screen, and then to hold the phone steady to keep the ball in the center as long as possible (Figure 1). They took the phones home with them to perform the test at least once a week for 6 months.

The investigators used the phone’s data to keep track of the speed of various maneuvers and how long each participant achieved the goals of the test. The same research group has piloted other tests involving finger tapping or foot tapping, for example. The results suggest that the Level Test might work better than these other smartphone-based tests (Figure 2). In people with MS, it also appears to align well with commonly used MS tests such as the Symbol Digit Modalities Scale (SDMT) and Paced Auditory Serial Addition Test (PASAT).

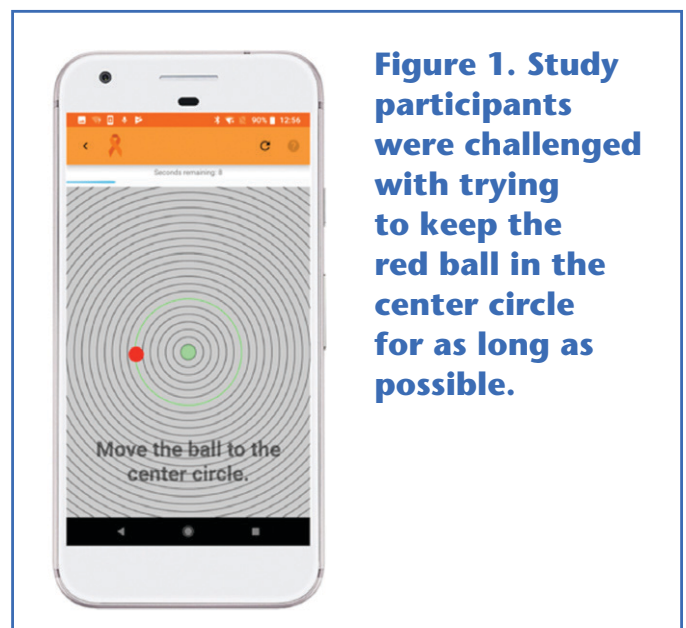


Figure 1. Study participants were challenged with trying to keep the red ball in the center circle for as long as possible.

What can be learned from a simple rolling ball? “The Level Test is a simple, easily-performed smartphone test that correlates strongly with... traditional MS disability scales and is sensitive to measure differences in disability between MS and [non-MS] cohorts,” the research team concluded. A longer-term trial over one year may help to determine if this test can distinguish disability progression among individuals with MS.

Reference

Boukhalova AK, Fan O, Weideman AM, et al. Smartphone level test measures disability in several neurological domains for patients with multiple sclerosis. *Front Neurol.* 2019 May 28;10:358.

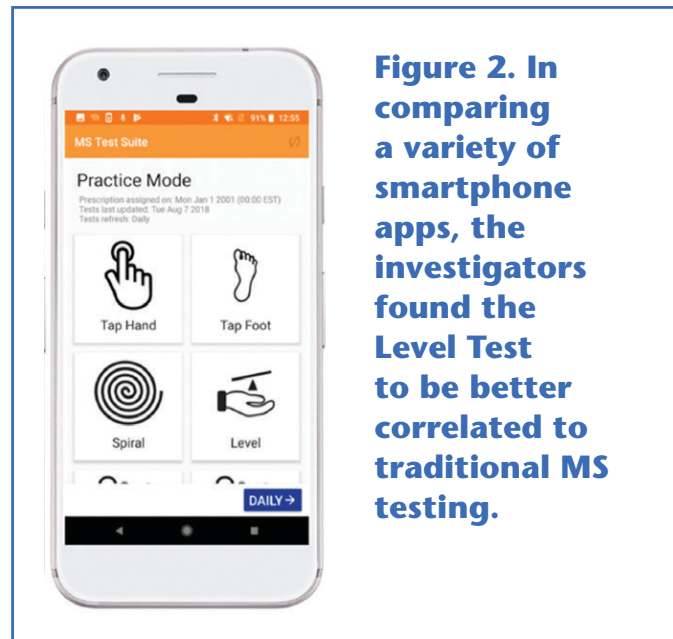


Figure 2. In comparing a variety of smartphone apps, the investigators found the Level Test to be better correlated to traditional MS testing.



MSMESSENGER

WHAT TO EXPECT ON THE NEXT NARCOMS SURVEY

Correction to the Brain Donation Resources

In the last issue, we provided information on national and international brain bank resources. Since then, the **National Multiple Sclerosis Tissue Repository Network at Columbia University** has changed its name to the **National Multiple Sclerosis Brain Bank (NMSBB)**. The contact information is the same and is listed below.

National Multiple Sclerosis Brain Bank (NMSBB)
 Mscenter_neuro@cumc.columbia.edu
<https://www.msbraindonation.org/>

As always, you can update your contact information with us by calling us at (800) 253-7884 or by email at msregistry@narcoms.org.

As a refresher for those who complete your surveys online: you no longer need to go to the NARCOMS website to access your surveys, and you do not need a login username or password. A link to your individual survey is emailed to you. You can just click on that link to access your survey. If you need to take a break, you can use the “save and return” function. A return code will be shown on the screen that you must save for use to access your partially completed survey. You also can enter your email address to have the return code emailed to you.

The Spring 2022 survey is going on now! Please be sure to check your emails or postal mailboxes and return your surveys. Thank you for your participation!

Play **WORDSEARCH**

Find the following hidden words relating to mobility and exercise.

PROGRESSIVE
LEARNING
ADAPT
TELEHEALTH

WHEELCHAIR
EXERCISE
CYCLING
BRAIN

NEURORACER
MOBILITY
VIRUS
GAME

COGNITION
VIDEO
DATA

K	V	U	M	V	D	Y	Y	A	D	A	P	T	V	J
K	K	Q	E	W	Y	A	Z	Y	N	O	S	E	P	J
T	V	B	L	X	O	Q	T	T	T	O	E	G	X	O
E	I	R	B	E	E	O	Y	A	F	Q	E	M	P	L
L	R	A	X	T	A	R	T	L	V	I	D	E	O	M
E	U	I	U	W	K	R	C	T	Z	N	Q	V	N	O
H	S	N	U	Q	N	P	N	I	H	H	X	X	E	B
E	J	W	V	S	Q	M	J	I	S	I	H	H	U	I
A	V	Q	Q	P	N	W	C	V	N	E	M	I	R	L
L	C	O	G	N	I	T	I	O	N	G	U	Y	O	I
T	G	P	R	O	G	R	E	S	S	I	V	E	R	T
H	A	N	I	A	M	F	W	B	I	O	S	R	A	Y
Y	M	J	X	G	J	A	F	Y	B	K	S	O	C	G
R	E	X	C	Y	C	L	I	N	G	L	R	K	E	U
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NARCOMS NOW

BE PART OF NARCOMS—HELP TO ADVANCE RESEARCH IN MS

Whether you were recently diagnosed with multiple sclerosis (MS) or have lived with it for years, your personal history with the disease helps contribute to improving the lives of others with MS.

Participation in the NARCOMS registry allows you to be part of the process. The data provided by participants gives researchers a clearer picture of how a condition like MS impacts the lives of those affected.

Participation in NARCOMS is confidential—your information is kept secure and completely private. If you have MS and are not yet participating in NARCOMS, or have been out of touch for a while, we would love to hear from you! Contact us at 1-800-253-7884 (toll-free U.S.) or via email at MSRegistry@narcoms.org.



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For more information on the CMSC visit www.mscares.org
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