



# Constant Therapy Health's Research Bibliography

For more information regarding Constant Therapy Health's scientific research, please contact [support@constanttherapy.com](mailto:support@constanttherapy.com).

---

July 2019

# 2019

## Comparison of therapy practice at home and in the clinic: A retrospective analysis of the Constant Therapy platform data set



**Themes:** Stroke, Aphasia, Efficacy

**Collaborators:** Aphasia Research Laboratory @ Boston University

Patients who suffer from speech deficits after a stroke benefit from speech and language therapy. Computer-based tools like Constant Therapy can be used by a healthcare professional when the patient comes to the clinic, or the patient can participate remotely at home, or both. We studied usage trends from 3,686 patients over four years and found that patients who did therapy at home (about every two days) were able to master cognitive tasks twice as quickly as those that only did therapy during clinic visits (about every five days). Patients were still making improvements to their functioning as much as two years after their stroke, and nearly a third of users were aged 71 or over. We believe that home-based computer therapy will increasingly become the norm for post-stroke rehabilitation.

*Godlove J, Anantha V, Advani M, Des Roches C, Kiran S. Comparison of therapy practice at home and in the clinic: A retrospective analysis of the Constant Therapy platform data set. Frontiers in Neurology. 2019;10:140. doi: 10.3389/fneur.2019.00140*

# 2017

## Relationship between self-administered cues and rehabilitation outcomes in individuals with aphasia: understanding individual responsiveness to a technology-based rehabilitation program



**Themes:** Stroke, Traumatic Brain Injury, Aphasia, Efficacy

**Study PI/Institution:** Aphasia Research Laboratory @ Boston University & Massachusetts General Hospital Institute of Health Professions

When patients receiving speech and language therapy for aphasia struggle to understand instructions or to complete an exercise, their therapist might prompt them with “cues” such as repeating the instructions, sounding out the first letter, or saying the category of object. But what if therapy is being delivered by a software program? In this study we looked at how often patients with aphasia used prompts and cues in Constant Therapy. As expected, more severely affected patients relied on prompts more often and continued to use them throughout therapy. Less severely affected patients used fewer cues and were able to reduce their use of them over time. Self-administered cues are an important part of delivering effective therapy without a human therapist to support patients on their path to recovery.

*Des Roches CA, Mitko A, Kiran S. Relationship between Self-Administered Cues and Rehabilitation Outcomes in Individuals with Aphasia: Understanding Individual Responsiveness to a Technology-Based Rehabilitation Program. Frontiers in Human Neuroscience. 20*

## RecoverNow: Feasibility of a mobile tablet-based rehabilitation intervention to treat post-stroke communication deficits in the acute care setting.



**Themes:** Stroke, Aphasia, Efficacy

**Study PI/Institution:** Ottawa Hospital, University of Toronto

While guidelines suggest that stroke patients should receive at least 3 hours of therapy per day five times a week, the reality is that access to speech-language therapists is often delayed and restricted. During inpatient care, post-stroke patients spend more than half their time in hospital resting alone in bed. During this rest time, there is an opportunity for digital therapy programs to be utilized by patients. This study tested the feasibility of offering digital therapy to patients in the first two weeks after their stroke. Over the course of six months, 30 patients with aphasia were given an iPad and a suite of therapist-selected apps including Constant Therapy. After a 15-minute training session, patients used the tablet on average for 2.5 hours a day, found digital therapy to be convenient, and the authors report that perceived barriers such as infection control were easily overcome. The authors conclude mobile tablet technologies could be a useful frontline tool to augment therapy sessions in the first weeks after a stroke.

*Mallet KH, Shamloul RM, et al. RecoverNow: Feasibility of a Mobile Tablet-Based Rehabilitation Intervention to Treat Post-Stroke Communication Deficits in the Acute Care Setting. PLOS ONE. 2016;11(12): e0167950. <https://doi.org/10.1371/journal.pone.0167950>*

## Feasibility of a mobile cognitive intervention in childhood absence epilepsy



**Themes:** Epilepsy, Pediatrics, Efficacy

**Study PI/Institution:** Feinberg School of Medicine @ Northwestern University

Children with childhood absence epilepsy (CAE) experience brief, momentary lapses in consciousness that can interfere with their cognitive development and academic performance. While these children could benefit from cognitive rehabilitation, there is little evidence and few resources to support them. In this study the authors tested the feasibility of an iPad-based approach that encouraged eight children with CAE to use Constant Therapy tasks for 20 minutes a day, four times a week. The children enjoyed using the app and believed it helped their cognitive abilities, and their parents agreed. Although statistical power was limited in such a small study, the authors found improvements in the cognition fluid composite and pattern comparison processing speed on the NIH Toolbox's cognitive domains. They conclude that mobile cognitive interventions like Constant Therapy have the "potential to be utilized as a component of a comprehensive treatment program for children with CAE."

*Glynn P, Eom S, Zelko F, Koh S. Feasibility of a mobile cognitive intervention in childhood absence epilepsy. Frontiers in Human Neuroscience. 2016;10:575. doi: 10.3389/fnhum.2016.00575*

## Computer-mediated cognitive-communicative intervention for residents with dementia in a special care unit: an exploratory investigation



**Themes:** Dementia, Aging, Efficacy

**Study PI/Institution:** St. Louis University

Digital therapy tools are now used across the human lifespan, including in the geriatric population. In this case study, an 83-year-old woman with moderate dementia living in a locked, special care memory unit was referred for speech-language therapy due to a decline in activities of daily living, safety, and communication. Over a 6-week period, 12 therapy sessions were administered with Constant Therapy to support attention, visual memory, mental flexibility, and visuospatial processing. The patient got better at completing the tasks and required less support to participate across sessions, with real-world benefits such as ignoring distractions in a busy environment and requiring less cues from caregivers. Remarkably, shortly afterwards, she was deemed safe to be discharged to a non-secure unit that facilitated greater independence. This study shows how people living with dementia can benefit from digital therapy programs.

*Postman WA. Computer-mediated cognitive-communicative intervention for residents with dementia in a special care unit: an exploratory investigation. Perspectives of the ASHA Special Interest Groups. 2016;1(15):68-78. doi: 10.1044/persp1.SIG15.68*

## How does severity of aphasia influence individual responsiveness to rehabilitation? Using big data to understand theories of aphasia rehabilitation



**Themes:** Stroke, Aphasia, Prognostic Factors

**Study PI/Institution:** Aphasia Research Laboratory @ Boston University

Which patients are most likely to benefit from speech-language rehabilitation after a stroke? And how much of which type of rehabilitation will produce the best outcomes? While many factors influence patient outcomes such as demographic characteristics, lifestyle, and the nature of the stroke experienced, few studies have explored the nature of the rehabilitation therapy offered, in part because traditional therapy is analogue, face-to-face, and goes unrecorded. Digitally delivered rehabilitation has the potential to offer up “big data” that might allow us to answer these questions and offer personalized therapy to patients. The author discusses that when digital therapy is tailored to the individual, both mild and severe patients show improvement. In fact, more severe patients showed more gains on standardized tests, suggesting that severity is not a negative prognostic indicator for successful outcomes. Additionally, digital therapy helps us understand how varying severity levels benefit from cues. Digital tracking of how often patients used “hints” during their tasks pointed towards clusters of paths to improved functioning that could help build personally-tailored programs for patients in a much more scalable way than today’s practice.

*Kiran S. How does severity of aphasia influence individual responsiveness to rehabilitation? Using big data to understand theories of aphasia rehabilitation. Seminars in Speech and Language. 2016;37:48-60. doi: 10.1055/s-0036-1571358. (Open access pending)*

# 2015

## Effectiveness of an impairment-based individualized rehabilitation program using an iPad-based software platform



**Themes:** Stroke, Aphasia, Efficacy

**Study PI/Institution:** Aphasia Research Laboratory @ Boston University

While some 200,000 Americans are diagnosed with aphasia each year and recovery is measured in years, most patients only receive the recommended intensive speech-language rehabilitation therapy for a matter of weeks. Digital therapy delivered via tablet computer offers the potential to fill this gap, but rigorous studies are needed to establish efficacy. In this preliminary study, 51 people with aphasia were divided into experimental (N=42) and control (N=9) groups to test the effectiveness of Constant Therapy compared to usual clinic-based care. The control group received 1 in-clinic visit per week while the experimental group received the weekly in-clinic visit plus use of Constant Therapy at home. While both groups showed improvement on language and cognitive tasks over the 10-week therapy program, the experimental home-based digital therapy group practiced more (around 4 hours a week) than clinic-based therapy (around 40 minutes) and showed greater changes in task accuracy and response latency.

*Des Roches CA, Balachandran I, Ascenso E, Tripodis Y, Kiran S. Effectiveness of an impairment-based individualized rehabilitation program using an iPad-based software platform. *Frontiers in Human Neuroscience*. 2015;8:1015. doi: 10.3389/fnhum.2014.01015*

# 2014

## Development of an impairment-based individualized treatment workflow using an iPad-based software platform



**Themes:** Stroke, Aphasia, Efficacy

**Study PI/Institution:** Aphasia Research Laboratory @ Boston University

While a number of technological advances have been deployed in speech and language therapy, these have tended to focus on expanding the reach of the clinician, employing remote therapy or “telemedicine” to link patient and clinician by videoconferencing. While clearly an improvement on clinic-based therapy, this still presents a bottleneck around the time and resources of highly-trained clinicians. An alternative approach, described in this paper, concerns the development of purely software-guided rehabilitation programs to provide a scalable platform to offer therapy to an unlimited number of patients. The authors describe the technical development of Constant Therapy’s automated assessment, task generation, and progression tracking, alongside four case studies of people with aphasia as they test the system. Across a range of impairment and language function, participants produced significant improvements and adopted the technology with ease. In the future clinicians may act more as “orchestrators of the rehabilitation process” and unblock the bottlenecks that limit patient recovery today.

*Kiran S, Des Roches CA, Balachandran I, Ascenso E. Development of an impairment-based individualized treatment workflow using an iPad-based software platform. *Seminars in Speech and Language*. 2014;35(1):38-50. DOI: 10.1055/s-0033-1362995 (Open access pending)*

## Detecting small- and large-scale fluctuations in language and cognitive performance: a longitudinal rehabilitation case study



**Themes:** Stroke, Aphasia, Efficacy

**Study PI/Institution:** Aphasia Research Laboratory @ Boston University

This case study describes the interesting case of a person with aphasia who used the Constant Therapy rehabilitation tool after experiencing a stroke. With Constant Therapy, this individual was able to continue to target language skills after discharge from speech-language therapy. Over the course of four months, he completed his therapy tasks on a daily basis, but when his performance suddenly deteriorated, it alerted his family that something might be wrong. Subsequent testing by his doctor revealed a second stroke that would otherwise have potentially gone undetected. After discharge from hospital for the second stroke, digital therapy was resumed, and the patient continued to work on maintaining and improving his skills at home. The authors suggest that digital therapy platforms not only help people access therapy more easily, but also it could act as “early warning systems” for follow-on strokes, which are particularly common in this population and a significant source of disability.

*Kiran S. Detecting small- and large-scale fluctuations in language and cognitive performance: a longitudinal rehabilitation case study. International Journal of Physical Medicine & Rehabilitation, 2014 2:3. DOI: 10.4172/2329-9096.1000203*