

Validation of an IPAD based therapy for language and cognitive rehabilitation in individuals with brain damage Swathi Kiran, Carrie Des Roches, Isabel Balachandran, Elsa Ascenso Department of Speech, Language, and Hearing Sciences, Boston University



INTRODUCTION

Individuals with language and cognitive deficits following brain damage likely require long-term rehabilitation.

Consequently, it is a huge practical problem to provide the continued communication therapy that these individuals require. In the present project, a large scale phase I clinical efficacy study was conducted to examine rehabilitation outcomes in patients who received continuous and self-paced rehabilitation language and cognitive program using iPADs.

RESEARCH QUESTIONS

Question: Does a structured therapy program that includes homework practice delivered through an IPAD result in significant gains in overall communication? We used Constant Therapy (www.constanttherapy.com) as the software platform.

Goal: Compare patients who receive a structured IPAD delivered therapy program that is practiced up to 7 days a week with patients who receive standard one-on-one individualized therapy that is provided 1 or 2 days per week by a therapist.

MEASUREMENT OUTCOMES

The level of patient compliance- Did patients practice the therapy?

The extent of patient engagement - How long did they practice therapy?

Percent change on each task for each patient and across patients was measured

Improvement on standardized tests

PARTICIPANTS

Forty-seven individuals with aphasia (goal is 50 patients) All participants either suffered a stroke or a traumatic brain injury

Age Range: 38- 87 years (*M* = 63 yrs.) At least one MPO (M = 63 months). For each participant: Western Aphasia Battery, Boston Naming Test, Pyramids and Palm Trees, Cognitive Linguistic Quick Test, ASHA FACS



EXPERIMENTAL DESIGN



THERAPY TASKS





Result 2: Average change in percentage points on standardized tests show changes for experimental patients but not for control natients

<u>RESULTS</u>										
				Improvement In Accuracy				Improvement In Latence		
	Task	Number of tasks	Aggregate	Accounting for Language	Accounting for Cognition	Number of tasks	Aggregate	Accounting for Language	Accounting for Cognition	
-	Category Identificatio	409	×	×	×	498	×	×	×	
	Category Matching	340	×	×	×	416	~	*	¥	
	Feature Matching	77	×	×	×	112	~	×	¥	
	Letter to Sound Match	147	*	*	*	190	*	*	*	
	Picture Spelling LV4	8	*	*	*	8	*	*	*	
	Reading Passage LV1	334	*	×	×	353	*	*	*	
	Reading Passage LV3	6	*	*	*	18	*	*	*	
	Rhyming	471	×	×	×	484	~	×	¥	
	Sound Identification	155	*	*	*	164	*	×	¥	
	Sound to Letter Match	150	*	*	*	154	*	*	*	
	Syllable Identification	37	*	*	*	47	~	×	¥	
	Word Copy LV2	24	*	*	*	57	*	*	*	
	Word Copy LV3	54	×	*	×	70	~	*	¥	
5	Word Identification	203	×	×	×	232	×	×	*	
gritue	Addition LV2	27	×	×	×	55	×	×	×	
	Addition LV3	12	*	*	*	16	×	×	*	
	Addition LV4	2	*	*	*	5	*	×	*	
	Clock Reading	39	×	*	¥.	98	×	×	×	
	Division LV1	36	*	*	*	52	*	×	*	
	Map Reading LV1	29	*	*	×	53	*	*	*	
	Map Reading LV2	12	*	*	*	16	*	*	*	
	Multiplication LV1	38	*	*	*	52	×	~	~	
	Picture Matching LV2	28	*	*	×	28	*	×	*	
	Subtraction LV1	2	*	*	*	72	*	*	*	
e	Word Matching LV2	23	×	×	×	23	×	×	×	

Result 3: Mixed logistical regression models show significant improvements over time for 13/25 therapy tasks even when the effect of language severity (WAB AQ) and cognitive severity (CLQT composite) are taken into account

CONCLUSIONS

- The results of this study highlight that patients with brain damage are extremely motivated to practice therapy at home when provided with appropriate access to therapy (delivered via an iPAD) and monitored by a weekly session with a dinician
- Preliminary results demonstrate the feasibility and preliminary success of such a structured continuous therapy in terms of determining language and cognitive treatment outcomes.

REFERENCES AND EVIDENCE FOR TREATMENT

	Cognitive, Longuege Operation	Sample Bridence
ound Matching	Retraining graphene to phonene conversion skills	Lazanti et al. (2000); Kivan (2005)
Letter Matching	Retraining phoneme to graphenie conversion skills	Luxanti et al. (2000); Kivan (2005)
7	Retraining viscospotal dalk and arthographic representation in agraphic	Beesan et al. (2000)
ry Completion	Retraining viscosportal skilk and arthographic representation in agraphic	Beesan et al. (2000)
ting/Completion	Estration orthography do Auditory stimuly phonene to graphene conversion	Rapp & Kane (2002); Rapp (2005); Beesan et al (2000); Beesan et al (2008); Kinae (2005)
	Retraining orthography via picture cituals phoneme to graphene conversion	Rapp & Kore (2002); Rapp (2005); Shallor (1991)
	Semantically categorizing liens to strengthes semantic representations	Kiran & Thampson (2003k); Kiran (2007); Kiran (2008); Kiran et al. (2009); Nettleton & Lesser (1991)
latching	Patient answers yes, foo question obout semantic features to strengthen semantic representations	Raymer & Ellowarth (2002); Kinan & Thampson (2002b); Kinan (2007); Kinan (2008); Kinan & Abbart (2007); Kinan et al. (2009)
Preduction Tesk	Comprehension and production of canonical and non-canonical sentence structures	Bastaanse et al. (2006); Cha-Reyec et al. (2011)
Mathing	Distinguishing between semantically related and non-related words to strengthen semantic representations	Dark & Havington (2026); Abel et al. (2005); Abel et al. (2007); Netfetan & Levaer (1991)
Teo S	Elemena Judament labara/actual segmentation and processing)	Spencer et al. (2000), Frankly et al. (2002), Rammer et al. (2002), Daveborah et al. (2004a)
ertification	Pharene Identification/ Comprehension (segmentation and processing)	Franklin et al. (2002), Roymer et al. (2002), Contex et al. (2007), Teuder et al. (2007), Kendull et al. (2008)
Salare .	Retrieving semantic phanological representations of words	Detaile et al. (1992); Haward et al (1985); Natiets (2002b)
destification.	Phonalization second processing	Rose et al. (2002)
	Auditory word recognition/ lexical representations; phanalogical processing	Chevery (2004); Crysela & Bernan (2005); Blumateix (1982)
feccege.	Retraining sentence and story comprehension; Iteracy	Compart (1998); Coplan and Evans (1990); Kata (1997)
and ing	becomonically retruiting visuospatial working momeny	Klugdærg et al. (2010); McNibler (2006); Maleer (1996); Soldlærg & Mateer (1997); Corvare (2000)
	bicrementally retraining visuospartial working memory	Kingdang et al. (2010); Multibler (2006); Converse (2000); Materier (1996)
ndring	borementally retraining auditory and quartal working memory	Kingdowy et al. (2010); Multibler (2006); Converse (2000); Matterr (1996); Soldwey & Hoterr (1987) ; Lew et al. (2007)
lathing	Sydematically retraining stacospatial, scanning and argonization ddlk	Chierane (2002); Park et al. (2001)
	Detecting components of executive functioning: Response biblicition and Mental Fieldblar	Erkons (1995); Bush (2015)
	Functionally strengthening stacospatial and spatial organization defaits via time	McCalue et al. (2000)
ling .	Rubinschill Diterventions to retriforce visusperceptual, scorving, and analytical resources dills.	Pack et al. (2001), Sudaw et al. (2001); Matter (1994); Sahilang & Mater (1987); Renyman et al. (2010); Canzan (2000)
•	Strengthening non-Inquistic cognitive processing and selective working memory defaults	Passalargit (2006); Ginell (2002); Alloway & Gatheranie (2006)
	Multimadul Intervention to Improve Took related drategies while retraining analytical reasones and working memory skills	Christenburles (2001); Vallet et al (2005); Bush (2005)
	Multiplanded intervention to improve mark related drategies while retraining another commutes and window measure with	Value et al (2005); Hills (1991); Delade et al. (1992); Back (2005)
blems.	incrementally retraining quantitative reasoning data by torgethin linguists	Pasalurahi (2006): Alles (2010): Clement (2002)
	cognitive processing, visual scoreing, and working memory defails	
*	becomestably retraining quantitative reasoning data by hargeting liquidate	Coarcave & Giustina (1992); Freedman et al. (1998); McCalse et al. (2000);
1 Tests	Exectionally manufacture and they work the manufacture to be calculated	Oceanor (2002): Wasterberg (2002): Law at al. (2002): Chattacholog (2001)
	shulegies	(101) (101) (101) (101)
n Sequencing	biografice relationsment of goal directed executive functioning diffs via functional planning and organization;	Comment & Wood (1987); Bank (2005)

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