Retrospective Analysis of Outcomes from Two Intensive Comprehensive Aphasia Programs

Carol Persad, PhD,[1] Linda Wozniak, MA,[2] and Ellina Kostopoulos, BSc[2]

[1]*University Center for the Development of Language and Literacy and Department of Psychiatry, University of Michigan, Ann Arbor;*
[2]*School of Human Communication Disorders, Dalhousie University, Halifax, Nova Scotia, Canada*

Positive outcomes from intensive therapy for individuals with aphasia have been reported in the literature. Little is known about the characteristics of individuals who attend intensive comprehensive aphasia programs (ICAPs) and what factors may predict who makes clinically significant changes when attending such programs. Demographic data on participants from 6 ICAPs showed that individuals who attend these programs spanned the entire age range (from adolescence to late adulthood), but they generally tended to be middle-aged and predominantly male. Analysis of outcome data from 2 of these ICAPs found that age and gender were not significant predictors of improved outcome on measures of language ability or functional communication. However, time post onset was related to clinical improvement in functional communication as measured by the Communication Activities of Daily Living, second edition (CADL-2). In addition, for one sample, initial severity of aphasia was related to outcome on the Western Aphasia Battery–Revised, such that individuals with more severe aphasia tended to show greater recovery compared to those with mild aphasia. Initial severity of aphasia also was highly correlated with changes in CADL-2 scores. These results suggest that adults of all ages with aphasia in either the acute or chronic phase of recovery can continue to show positive improvements in language ability and functional communication with intensive treatment. **Key words:** *aphasia, intensive therapy, language rehabilitation, outcome*

Intensive speech and language therapy for individuals with aphasia has generally been shown to be more effective than standard therapy alone,[1-5] although not all studies have supported this finding.[6,7] Understanding what factors may predict outcomes of intensive speech and language therapy after stroke or other neurological insult is key to determining which individuals may benefit from this type of therapy. To this end, we first present a literature review of studies that have examined the impact of different variables on language outcomes. We next report on the general characteristics of participants who attend intensive comprehensive aphasia programs (ICAPs) to gain insight on potential factors that may be important predictors of outcome. Then using data from 2 ICAPs, the relationship between demographic variables, aphasia severity, and language outcomes are examined.

In a recent Cochrane review evaluating the effectiveness of speech and language therapy after stroke, Brady and colleagues[8] conducted a meta-analysis on data from available randomized control trials (RCTs). A comparison between high-intensity and low-intensity speech and language therapy was done as part of the larger analyses. The data suggested better outcomes for high-intensive than low-intensive therapy in terms of functional communication, writing skills, and improvement in overall level of aphasia severity, but no differences between the 2 intensities of therapies for specific measures of expressive and receptive spoken language. However, the authors cautioned that these findings were based on a very small number of RCTs, which limited the ability to make generalizable statements.

Defining what constitutes intensive therapy still remains controversial and likely accounts in part for the conflicting results. For instance, the high-intensity studies included in the Cochrane review ranged from 4 to 20 hours of therapy a week, whereas studies described as low intensity ranged from 1.5 to 15 hours a week. Clearly this overlap in the definition of high- versus low-intensity therapy makes it difficult to evaluate and compare

Top Stroke Rehabil 2013;20(5):388–397

www.strokejournal.com

doi: 10.1310/tsr2005-388

outcomes as a function of level of intensity. In a review that specifically addressed the relationship between amount of therapy and outcome,[1] findings showed that those participants who received more than 8.8 hours a week had more positive outcomes than those who averaged 2.3 hours a week. In addition, correlations demonstrated that the amount of therapy hours a patient received was related to an improvement in scores on the Porch Index of Communicative Ability (PICA)[9] and the Revised Token Test.[10]

Level of intensity is only one factor that can affect treatment outcome. McClung, Rothi, and Nadeau[11] addressed the need to understand why some individuals with aphasia benefit from a given treatment approach whereas others do not and presented a framework for considering other "ambient" factors that had the potential to affect speech and language therapy outcome. Intra-individual factors included fixed factors that were present prior to the stroke such as gender, age, ethnicity, language spoken, and socioeconomic status and poststroke factors such as lesion location and size, time post onset, depression, and participation in aerobic exercise. Extra-individual factors included family and other social support and communication level. Understanding the impact of these factors on therapy success is important in determining appropriateness for treatment and prognosis. Brady et al commented on the need for future studies to evaluate factors that could impact the effectiveness of speech and language therapy, such as patient characteristics, time post onset, and type of aphasia.[8]

Despite this need, there has been little data published with regard to patient profiles and characteristics that predict the best benefits from intensive treatment. The question about who can receive the most benefit from intensive aphasia treatment is compelling. The cost to attend programs is often high – not only with regard to monetary demands, but also with regard to individual and family commitments of time. Perhaps most important, there is considerable anticipation and hope on the part of the person with aphasia that attendance at the program will result in marked communication gains.

The limited data available relating patient characteristics to outcome pertain primarily to time post onset and initial severity. Some studies have shown more significant improvement in patients in the acute phase of recovery, although improvements do continue to be documented in patients with chronic aphasia.[5-6,12] The results of studies of initial level of severity have been equivocal, with some studies showing relatively more improvement in participants with more severe impairment and other studies demonstrating no relationship between severity and outcome.[2,5,13,14]

Marshall and colleagues[15] examined the characteristics of 3 groups of participants with aphasia who were rated to have different levels of outcome (poor, fair, and marked) from individual therapy. Initial analyses suggested that participants in the poor outcome group were older, had more thromboembolic strokes as the cause of aphasia, and had greater aphasia severity and more auditory comprehension problems than participants in the other 2 groups. Although the focus of the study was not on intensive therapy programs, there was a considerable difference in the amount of therapy received by the 3 groups, with the marked improved group receiving more than 2.5 times the amount than the poor outcome group. Using a regression analysis, the authors found that number of treatment hours was the most significant predictor of improvement on the PICA, followed by months post onset. Age was also found to be a significant predictor.

Pederson et al[16] examined a number of factors impacting therapy outcome at 1 year. This study showed that the overall severity of the stroke and resulting aphasia predicted outcome, whereas type of aphasia and demographic variables such as age and gender did not. A similar pattern was found by Lazar et al[17] when looking at factors that affect outcome in the acute recovery phase.

Intensive Comprehensive Aphasia Programs

The literature has focused on the intensity of treatment, but the type of treatment and the format in which treatments are combined may also impact outcomes. An intensive comprehensive aphasia program (ICAP) is defined as a service delivery model that provides a minimum of 3 hours of daily treatment over a specified period

of at least 2 weeks to a cohort of participants who begin and end the program at the same time.[18] It is comprehensive in scope, utilizing individual and group therapy, patient and family education, and technology to target the impairment and the activity/participation levels of language and communication functioning. The overarching goal of the ICAP is to maximize communication potential and enhance life participation. The comprehensive nature of the program differentiates an ICAP from services that provide massed daily practice of the same treatment (eg, constraint-induced language therapy[4]).

Given the fact that ICAPs can be cost prohibitive and take a considerable amount of resources, it is important to document treatment outcomes for these programs and to understand who might benefit most from this type of approach. The challenge in answering these questions is evident, as most programs are generally run as clinical programs that do not include control groups. However, a number of programs have collected extensive data about the clients they have served as well as clinical outcome data. In 2011, 6 ICAPs shared their data on participant characteristics and assessment tools[18]:

- InteRACT: Intensive Residential Aphasia Communication Therapy program, Dalhousie University, Halifax, Nova Scotia, Canada
- LIFT: Language Impairment and Functioning Therapy, Brisbane, Queensland, Australia
- North Memorial's Intensive Aphasia Program, Minneapolis, Minnesota
- PIRATE: Program for Intensive Residential Aphasia Treatment and Education, VA Pittsburgh Geriatric Research, Education and Clinical Center (GRECC), Pittsburgh, Pennsylvania
- Rehabilitation Institute of Chicago's Intensive Aphasia Program, Chicago, Illinois
- UMAP: University of Michigan Aphasia Program, Ann Arbor, Michigan

Participant Characteristics of Six ICAPs

Table 1 provides a demographic profile of 436 participants enrolled in the 6 international ICAPs. Not all programs used the same system for classifying the demographic information, which is noted in the column representing number of programs reporting. For some demographic variables, participants were relatively similar within and across programs. For example, more males than females attended ICAPs. In addition, most participants were English speaking, of Caucasian descent, and typically had worked in professional careers. The majority (72%) had education beyond high school, with 56% having university education. For other demographic variables, a wide range of participant characteristics was recorded. For example, participants' ages ranged from 16 years old to mid to late 80s, with the average age being 53 years. The time post onset of neurological event was also quite variable, with participants in both acute and chronic stages of recovery choosing to

Table 1. ICAP participant characteristics[a]

Demographic variables	No. of programs reporting n/N	Participant characteristics
Gender	6/6	Female 25%; Male 75%
Age, years	6/6	Mean = 53; range, 16-86
Time post onset, months	6/6	Mean = 24.55; range, 1-222
Etiology	5/6	CVA, 91%; TBI, 6%; other (tumor, encephalitis), 3%
Aphasia type	4/6	Mean WAB-R AQ = 57.4: global, 5%; Broca, 45%; Wernicke, 8%; anomic, 24%; conduction, 8%; mixed, 10%
Education	4/6	High school or less, 28%; some college, 17%; bachelor's degree, 26%; postgraduate degree, 29%
Ethnicity	5/6	Caucasian, 91.6%; African American, 6.4%; Asian, <1%; South Asian, <1%; Native/ Aboriginal, <1%
Native language	5/6	English, 94%-100%; other (French, Hindi, Inuktitut, Japanese, Spanish, Swedish, Ukranian), 1%-5%
Occupation	5/6	Patients represent a wide variety of occupations; they generally have higher educational backgrounds and work in professional careers, with many in the fields of medicine, law, and business.

Note: CVA = cerebrovascular accident; ICAP = intensive comprehensive aphasia program; TBI = traumatic brain injury; WAB-R AQ = Western Aphasia Battery–Revised aphasia quotient.

[a] From Cherney et al, 2011.[18]

attend. Although the majority of clients developed aphasia after stroke, a mix of aphasia types was represented.

Characteristics of participants attending ICAPs can be compared to the demographics of the aphasia population described in the literature. Dickey et al[19] found that the percentage of men and women who had aphasia following stroke was fairly similar (51% women and 49% men). In contrast, participants in the ICAPs were predominately male, as noted previously, with proportions of 25% women and 75% men reported overall. The average age of individuals with aphasia present at discharge from inpatient facilities was 73 ± 13 years compared to the ICAP average age of 53 years.

Documentation of the characteristics of ICAP participants provides an opportunity to study factors that might affect program outcome. However, a comparison of outcomes across the different centers is hampered by the fact that there is no standardized approach to measurement. In reviewing the list of outcome measurements utilized by the different ICAPs (see **Table 2**), it is clear that there is great variability in the choice of measurement used.[18] Types of assessment tools include performance-based tests that objectively assess language impairment and communicative functioning, self-report measures that assess a range of behaviors including functional language skills and quality of life, and caregiver assessments of language ability. A consensus guideline of a core outcome battery to be used in both clinical centers and research studies could prove very useful in developing future research studies that can provide data that are applicable to the aphasia population.

Table 2. Outcome measurements of ICAPs[a]

Performance-based assessment
*Comprehensive Aphasia Test (CAT) [30]
*Western Aphasia Battery–Revised (WAB-R) [20]
*Boston Naming Test (BNT)[31]
*Reading Comprehension Battery of Aphasia, second edition (RCBA-2)[32]
Porch Index of Communicative Abilities (PICA)[9]
Test of Adult and Adolescent Word Finding[33]
Revised Token Test (RTT)[10]
Discourse analysis
Functional/Quality of life assessment
*ASHA Quality of Communication Life (ASHA QCL)[34]
Communication Activities of Daily Living, second edition (CADL-2)[21]
Self-assessment of communication skills (SACS)[35]
Communication Confidence Rating Scale for Aphasia (CCRSA)[36,37]
Assessment of Living with Aphasia (ALA)[38]
Burden of Stroke Scale (BOSS)[39]
Goal Attainment Scaling[40]
Caregiver ratings
*Communicative Effectiveness Index (CETI)[22]
ASHA FACS[41]

Note: Asterisk indicates tests that are used by more than one intensive comprehensive aphasia program (ICAP). ASHA = American Speech-Language-Hearing Association; FACS = functional assessment of communication skills.

[a]From Cherney et al, 2011.[18]

Outcome Data from Two ICAPs

The article presents outcome data from 2 ICAPs: University of Michigan Aphasia Program (UMAP) and Intensive Residential Aphasia Communication Therapy (InteRACT) at Dalhousie University. For both UMAP and InteRACT, participants' communication performance at the beginning and end of treatment was assessed using the Western Aphasia Battery–Revised[20] (WAB-R). For InteRACT, communication function in daily life was assessed using the Communication Activities of Daily Living, second edition[21] (CADL-2) and caregiver ratings of the Communicative Effectiveness Index[22] (CETI).

The primary objectives of the outcomes analyses were to (a) determine the proportion of participants who achieved a clinically significant outcome and (b) examine the relationship between specific participant characteristics and clinical outcome. For the first objective, clinical outcome was defined in a binary fashion, with participants identified as either achieving or not achieving a minimum score defined as indicating clinically significant results. For the WAB-R, the aphasia quotient (AQ) must have increased by 5 or more points,[23] and for the CADL-2 and CETI, there must have been changes of at least 10 points and 12 points, respectively,[24] for the participant to have achieved a clinically significant result.

For the second objective, analyses were conducted to determine whether clinical outcome was predicted by the following participant variables: age, time post onset in months, gender, and pretreatment aphasia severity score.

ICAP 1: UMAP

UMAP is an intensive treatment program that provides individual, group, and computer-based therapy. At the time of this data collection, the program ran for 6 weeks, with individuals receiving 23 hours of therapy a week. The therapeutic approach was tailored to meet each individual's goals and included several research-based interventions. Caregivers were encouraged to attend and participate in sessions to allow them to support the participants' continued therapeutic work after returning home. Participants also received 1 hour each of music and art therapy a week. Additional weekly social and recreation activities were designed to provide opportunities for participants to work on functional communication skills.

Fifty-four participants who attended UMAP from 1999 to 2010 and were administered the WAB-R pre and post treatment were included in the analyses. The mean (SD) age of this group was 54.18 (SD 15.28; range, 24- 81 years). Sixty-nine percent of the sample was male (36 men and 16 women). Although the average time post onset (TPO) for the entire group was 16.6 months (SD 18.1), there was a wide range of time since aphasia onset (1 to 112 months). The pretreatment WAB-R aphasia quotient (WAB-R AQ pre) for the group was 57.68 (SD 24.52). There was a statistically significant improvement in the WAB-R AQ score after treatment using a paired sample *t* test, with the average WAB-R AQ post score being 69.11 (SD 20.58; $P < .00$).

The participants were divided into 2 groups based on whether there was a clinically significant improvement in the WAB-R AQ as defined by an improvement of 5 or more points.[23] Forty-two individuals were classified as showing clinically significant improvement, and 10 were not. A one-way analysis of variance (ANOVA) demonstrated that there was no significant difference in either age or TPO between the 2 groups ($F_{1,51} = 0.18$, P = ns, and $F_{1,51} = 0.73$, P = ns, respectively) (**Table 3**). A Pearson chi-square test to determine gender differences between the groups was also nonsignificant ($\chi^2_1 = 2.51$, P = ns). Severity of aphasia prior to beginning treatment was defined based on the initial WAB-R AQ score (AQ pre).

Table 3. Demographic characteristics of patients at UMAP with and without a clinically significant change in the WAB-R aphasia quotient

Characteristic	AQ change ≥ 5	AQ change < 5
Age, years	54.63 (14.41)	52.32 (19.3)
Gender, male	64.3%	90%
Time post onset, months	15.55 (19.3)	21.0 (11.36)
WAB-R AQ pre score	52.91 (23.58)	77.73 (17.89)

Note: Values given as mean (SD), unless otherwise indicated.
AQ = aphasia quotient; UMAP = University of Michigan Aphasia Program; WAB-R = Western Aphasia Battery–Revised.

There was a significant difference in AQ pre scores between persons who showed a clinically significant improvement and those who did not. Specifically, the mean AQ pre score for the group that showed a clinically significant improvement indicated a greater initial severity of impairment ($\chi^2_1 = 52.91$; SD 23.58) than the group without a clinical improvement ($\chi^2_1 = 77.73$; SD 17.89). In fact, of the 10 participants who did not show an improvement, 3 exhibited a ceiling effect with scores very close to the highest score, such that it was not possible for them to demonstrate a 5-point improvement.

To further examine the relationship between these variables and outcome, correlational analyses were performed to look at the relationship among age, TPO, WAB-R AQ pre score, and WAB-R AQ change score. There was no significant relationship between age ($r = -0.06$, $P = .7$) or TPO ($r = -.21$, $P = .14$) and the WAB-R AQ change score, demonstrating that neither of these variables affected the outcomes of the therapy. In contrast, the AQ pre score was significantly correlated with the AQ change score such that persons with lower initial AQ scores and more severe aphasia demonstrated the greatest change in language skills following intensive therapy ($r = -0.61$, $P < .00$).

ICAP 2: InteRACT Program

The InteRACT program is a 4.5-week treatment program offering 5 hours of speech and language therapy daily. Individuals with aphasia must attend with a communication partner (family member or friend) who can support carryover

of new skills when the participant returns home. Daily therapy is delivered in the following format: 1 hour of individual therapy targeting impairment-based language treatment and motor speech skills (eg, Melodic Intonation Therapy,[25] Visual Action Therapy[26]); 1 hour of individual therapy targeting reading and writing skills (eg, Anagram and Copy Treatment[27]); 1 hour of individual therapy targeting functional and multimodality communication skills (eg, Promoting Aphasics' Communicative Effectiveness,[28] partner training, phone use); and 1 hour of individual therapy targeting computer skills (eg, e-mail, Internet use). An additional hour of group therapy targets conversation-based activities, constraint-induced language treatment,[2,4] and community integration activities. In addition to speech and language therapy, individual and group recreation therapy targets a return to previous leisure activities and/or the introduction of new leisure opportunities (2-5 hours/week). Physical therapy is also provided in group sessions 2 hours per week.

Pre- and post-therapy outcome data were obtained for 119 patients from 2002 to 2012. Approximately 25% of participants attended more than 1 session; therefore their data for subsequent programs was not included in the analysis. With this exclusion, data for 71 first-time participants were analyzed. Of these, 51 (72%) were men and 20 (28%) were women, with a mean age of 54 years and TPO of 24.5 months.

Three outcome measures that assess communication impairment, functional communication activity, and participation were analyzed: WAB-R AQ, CADL-2, and CETI, respectively. As previously described, participants were found to have exhibited clinical improvement if they achieved a change score of at least 5 points for the WAB-R AQ, a change of at least 10 points for the CADL-2, and a change of at least of 12 points for the CETI.[23,24] Participants with scores that were very close to the ceiling were removed from the data analysis, because it was not possible for these individuals to demonstrate a clinically significant change. The following cut-off scores were defined: WAB-R AQ, ≤95; CADL-2, ≤90; CETI, ≤88. The number of patients who were included in the analysis for each outcome measure was 70 for AQ, 55 for CADL-2, and 69 for CETI.

Table 4. Comparison of characteristics of 2 groups at InteRACT

	Participants who showed no clinical improvement	Participants who showed clinical improvement	*P* value for a *t* test comparing the means
WAB-R AQ	(n = 25)	(n = 45)	
Age	54 (3.3)	54 (1.85)	.98
Gender[a]	0.28 (0.09)	0.29 (0.07)	.94
TPO	28 (5.0)	22 (2.25)	.29
AQ pre	62 (6.67)	50 (3.16)	.11
CADL-2	(n = 27)	(n = 28)	
Age	54 (2.95)	58 (2.1)	.23
Gender[a]	0.41 (0.1)	0.25 (0.09)	.22
TPO	24 (4.3)	25 (3.6)	.90
AQ pre	52 (4.46)	39 (3.67)	.023
CETI	(n = 34)	(n = 35)	
Age	55 (2.5)	54 (2.3)	.64
Gender[a]	0.21 (0.07)	0.34 (0.08)	.21
TPO	31 (4.45)	(2.45)	.017
AQ pre	54 (4.62)	54 (4.62)	.96

Note: Values shown as mean (SD). AQ pre = aphasia quotient pre score; CADL-2 = Communication Activities of Daily Living, second edition; CETI = Communicative Effectiveness Index; TPO = time post onset; WAB-R AQ = Western Aphasia Battery–Revised aphasia quotient.

[a]The means for gender give the proportion of female subjects.

Table 4 shows the number of participants who had clinically significant improvement versus those who failed to exhibit such improvement for the 3 outcome measures (WAB-R AQ, CADL-2, CETI). The number of participants who showed clinically significant improvement was converted to a proportion of the total number of participants and statistically analyzed using interval estimation. The proportion of participants who showed a clinically significant improvement in each outcome measure was as follows: WAB-R AQ = .64; CADL-2 = .51; CETI = .51. Calculation of 95% confidence intervals (95% CI) yielded the following: WAB-R AQ = .53 to .75; CADL-2 = .38 to .64; CETI = .39 to .63. These results show that approximately half of InteRACT participants may be expected to exhibit a clinically significant outcome on measures of communication activity and participation in daily life, and a higher percentage of participants (approximately two-thirds) may be expected to exhibit clinically significant improvement in communication performance in a test situation. It is important to note that out of the total 71 patients, only 3 (4%)

did not demonstrate clinically significant gains on any of the 3 outcome measures analyzed.

Table 4 also shows the means and standard deviations for the participant characteristics of age, gender, TPO of aphasia in months, and aphasia severity at the beginning of treatment (as measured by WAB-R AQ pre) for the 2 participant groups (ie, those who showed clinically significant improvement and those who did not show such improvement). Inspection of these data shows that the means and standard deviations for all characteristics are similar across the 2 groups. We used *t* tests to determine statistical differences in the means. Only 2 comparisons were statistically different. WAB-R AQ pre scores were significantly lower for participants who showed clinical improvement on CADL-2 relative to those who did not ($P = .023$), and TPO was significantly shorter for participants who showed clinical improvement on the CETI ($P = .017$) compared to those with no clinical improvement. No other comparisons were significantly different. Therefore, only pretreatment severity and TPO differentiated the 2 groups; for both variables, this differentiation occurred for 1 test only and not the other 2.

Correlations were conducted to examine the relationship between pairs of the following variables: change scores for the 3 outcome measures, TPO in months, age, and gender (proportion of females relative to total number of participants). The values for the correlations are displayed in **Table 5**. The only significant correlations at the .05 level were between age and TPO ($r = 0.31$, $P = .022$) and age and gender ($r = -0.27$, $P = .052$). These results suggested that patients who were older attended the program at a later TPO of their aphasia and that men were more likely to seek treatment at a young age than women. In addition, there was a trend for TPO and age to be associated with the change in WAB-R AQ scores (ΔAQ: $r = -0.25$ and -0.26, respectively, with corresponding $P = .063$ and .061). Although not statistically significant at the standard level of significance (ie, .05), they are nearly so, suggesting the possibility that those individuals who are older or wait longer before starting intensive therapy exhibit a smaller change in AQ.

It is worth noting that all 3 correlations relating change scores on one outcome measure to change scores on another were very low (with 2 being close to 0.0) and none were statistically significant. More specifically, changes in AQ scores correlated poorly with changes in CADL-2 and CETI scores, and changes in CETI scores correlated poorly with changes in CADL-2 scores. These findings support the clinical use of all 3 measures, as they provide different information about communication outcomes for participants.

Correlations were also calculated for severity of aphasia, as reflected in initial WAB-R AQ score (AQ pre) and changes in scores on the 3 outcome measures. AQ pre was found to be significantly correlated with changes in CADL-2 scores ($r = -0.45$, $P = .00$) but was not significantly correlated with either changes in AQ ($r = -0.21$, $P = .084$) or CETI scores ($r = 0.13$, $P = .27$). These results indicate that individuals with more severe aphasia at the beginning of therapy showed significantly

Table 5. Correlation matrix of age, time post onset (TPO), gender, and clinically significant change in the outcome measures (n = 54)

	TPO	Age	Gender	ΔAQ	ΔCADL-2	ΔCETI
TPO	1	0.31*	0.018	−0.25**	0.021	−0.20
Age	–	1	−0.27*	−0.26**	0.12	0.029
Gender	–	–	1	0.16	−0.097	0.22
ΔAQ	–	–	–	1	0.15	0.016
ΔCADL-2	–	–	–	–	1	0.047
ΔCETI	–	–	–	–	–	1

Note: ΔAQ = change in aphasia quotient pre score; ΔCADL-2 = change in Communication Activities of Daily Living, second edition, score; ΔCETI = change in Communicative Effectiveness Index score.

*Significant at $P < .05$.

**Trend for significance at $P < .06$.

greater improvement for the CADL-2, but pretreatment severity of aphasia was not closely related to amount of change on the other measures.

Discussion

Intensive therapy, regardless of type of treatment, has been shown to be effective in the literature; however little is known about the characteristics of persons who attend ICAPs and whether there are certain factors that could predict therapy outcome. Having more information regarding which participants may benefit more from ICAPs is important given the high cost, substantial time commitment on the part of individuals with aphasia and their families, and the limited number of intensive programs available.

The data from 6 ICAPs indicate that there is a wide range of individuals who attend. The majority of participants across the different programs are male with an average age of 53 years, although participants' ages cover the entire lifespan. This finding is in contrast to what is known about the aphasia population after stroke in general, as aphasia due to stroke has been shown to affect men and women equally, with an average age in the 70s.[19] One can conjecture that younger adults are more motivated to get more intensive treatment with a goal of significantly improving their quality of life and possibly returning to work. However, these data also suggest a bias in persons who choose to attend ICAPs that could be a factor that influences the reported success of many of these programs and makes it difficult to generalize findings about variables that impact outcome to the general population. Nonetheless, the findings reported in this current study are an important first step and can provide useful information to guide future research.

In examining the relationship between age, gender, and TPO and outcome measures, the results from 2 ICAP programs demonstrated very similar results. First, results show that the majority of individuals enrolled in both programs experienced improvement on objective language impairment testing (AQ) after intensive language therapy. Further, the data from InteRACT provided information regarding functional outcomes. Approximately half of the participants demonstrated a clinically significant improvement in functional communication skills after therapy. A similar pattern was noted in caregiver assessments of the participants' language skills. Therefore, more than half the individuals made a clinically significant gain on at least 1 outcome measure. Fewer than 5% did not make a clinically significant gain on any of the 3 measures.

Although the majority of participants attending ICAPs demonstrate improvement, not all individuals make significant gains. Understanding which factors predict outcome is important in decision making regarding who will gain the most benefit and should be referred to an ICAP. Across both samples of participants, age, gender, and TPO were not highly predictive of which individuals experienced a clinically significant improvement in overall language functioning. However, for one sample, TPO differentiated those participants who achieved clinical improvement on the CETI and both TPO and age showed a tendency toward being significantly correlated with change in AQ scores. In addition, severity of aphasia at onset of therapy was found to be related to outcomes. For the UMAP sample, the AQ pre score differentiated participants who achieved clinical improvement in AQ score; for the InteRACT sample, it differentiated those who achieved clinical improvement in CADL-2 score from those who did not. Furthermore, AQ pre scores were highly correlated with changes in CADL-2 scores. However, initial severity of aphasia did not predict clinical improvement in general. Even though previous studies have looked at initial severity as a predictor of improvement, they have done so at the acute stage of onset.[17,29] The data in the current study suggest that severity was not a predictor for improvement across the board, perhaps due to the fact that participants exhibited both acute and chronic aphasia. Participants across the 2 sites had AQ pre scores ranging from very severe to mild (UMAP, 6.1 to 96.6; InteRACT, 8.4 to 96.5). Exploratory analysis indicated that persons who had an AQ pre score of less than 90 had the largest probability and magnitude of clinically significant improvement. These findings can be compared to those of Pederson, Vinter, and Olsen[16] who showed that outcome for improvement in language function for patients in the acute stages

post stroke was predicted by initial severity and not age or gender. However, there is a ceiling effect on the WAB-R that affects the ability to determine a relationship between our variables and language outcome at the milder levels of aphasia. It will be important for future research to use measures that are more sensitive to change in higher level language functioning to better understand what factors affect successful outcomes that are seen even in individuals with mild aphasia.

Many of the ICAPs include caregiver education that can lead to caregivers having greater insight and more realistic expectations of their family members' communication skills, which affects responding styles on functional questionnaires that may be independent of actual changes in language functioning. There is limited research on partner perception of communication skills post stroke, and this is an area for future study.

With regard to the timeline identified for the CADL-2, findings showed that changes in functional outcomes do not appear to be related to TPO. Individuals make changes early post onset as well as in the chronic phases of the recovery process.

There are several limitations to this study. Causal relationships cannot be inferred. The observed relationships are only suggestive due to the small sizes of some of the groups and the statistical measures that were used. Additional studies with a larger group of patients would be required before firm conclusions could be drawn. Further, the data presented here are retrospective in nature. Prospective studies that include randomized control trials would allow for more a rigorous evaluation of what variables are important to successful language outcomes. Other patient demographics (eg, occupation, education, lesion location, and extent) as well as outcome measures that assess the activity and participation levels of communication could also be examined.

This is the first examination of the characteristics of individuals with aphasia who attend ICAPs. Although preliminary, the findings suggest that age, gender, and TPO are not highly predictive of therapy outcome. Individuals of all ages can benefit from intensive and comprehensive therapy programs, regardless of whether they are in the acute or chronic stages of recovery.

REFERENCES

1. Bhogal SK, Teasell R, Speechley M. Intensity of aphasia therapy: Impact on recovery. *Stroke.* 2003;34:987-993.
2. Cherney LR, Patterson JP, Raymer A, Frymark T, Schooling T. Evidence-based systematic review: Effects of intensity of treatment and constraint-induced language therapy for individuals with stroke-induced aphasia. *J Speech Lang Hear Res.* 2008;51;1282-1299.
3. Denes G, Perazzolo C, Piani A, Piccione F. Intensive versus regular speech therapy in global aphasia: A controlled study. *Aphasiology.* 1996;10:385-394.
4. Pulvermuller F, Neininger B, Elbert T, Mohr B, et al. Constraint-induced therapy of chronic aphasia after stroke. *Stroke.* 2001;32:1621-1626.
5. Robey RR. A meta-analysis of clinical outcomes in the treatment of aphasia. *J Speech Lang Hear Res.* 1998;41:172-187.
6. Bakheit AMO, Shaw S, Barrett L, et al. A prospective, randomized, parallel group, controlled study of the effect of intensity of speech and language therapy on early recovery from poststroke aphasia. *Clin Rehabil.* 2007; 21:885-894.
7. Sage K, Snell C, Lambon Ralph MA. How intensive does anomia therapy for people with aphasia need to be ? *Neuropsychological Rehabil.* 2011;21:26-41.
8. Brady MC, Kelly H, Godwin J, Enderby P. Speech and language therapy for aphasia following stroke. *Cochran Database Syst Rev.* 2012;5:1-228.
9. Porch BE. *Porch Index of Communicative Ability*. Palo Alto, CA: Consulting Psychologists Press; 1971.
10. McNeil MR, Prescott TE. *Revised Token Test.* Austin, TX: Pro-Ed; 1978.
11. McClung JS, Gonzalez Rothi LJ, Nadeau SE. Ambient experience in restitutive treatment of aphasia. *Frontiers Human Neurosci.* 2010;4:1-19.
12. David R, Enderby P, Bainton D. Treatment of acquired aphasia: Speech therapists and volunteers compared. *J Neurol Neurosurg Psychiatry.* 1982;45:957-961.
13. Code C, Torney A, Gildea-Howardine E, Willmes K. Outcome of a one-month therapy intensive for chronic aphasia: Variable individual responses. *Semin Speech Lang.* 2010;31:21-33.
14. Lee JB, Kaye RC, Cherney LR. Conversational script performance in adults with non-fluent aphasia: Treatment intensity and aphasia severity. *Aphasiology.* 2009;23:885-897.
15. Marshall RC, Tompkins CA, Phillips DS. Improvement in treated aphasia: Examination of selected prognostic factors. *Folia phoniat.* 1982;34:305-315.

16. Pederson P, Vinter K, Olsen T. Aphasia after stroke: Type, severity and prognosis. The Copenhagen Aphasia Study. *Cerebrovasc Dis.* 2004;17:35-43.
17. Lazar ML, Minzer B, Antoniello D, Festa JR, Krakauer JW, Marshall RS. Improvement in aphasia scores after stroke is well predicted by initial severity. *Stroke.* 2010;42:1485-1488.
18. Cherney L, Doyle P, Hula W, et al. Intensive comprehensive aphasia programs: Philosophy, procedures and outcomes. Presented at: Annual Convention of the American Speech Language Hearing Association; 2011; San Diego, CA.
19. Dickey L, Kagan A, Lindsay MP, Fang J, Rowland A, Black S. Incidence and profile of inpatient stroke-induced aphasia in Ontario, Canada. *Arch Phys Med Rehabil.* 2010; 91:196-202.
20. Kertesz A. *Western Aphasia Battery–Revised.* San Antonio, TX: Harcourt Assessment; 2006.
21. Holland AL, Frattali CM, Fromm DS. *Communication Activities of Daily Living-2*. Austin, TX: Pro-Ed; 1999.
22. Lomas J, Pickard L, Bester S, Elbard H, Finlayson A, Zoghaib C. The Communicative Effectiveness Index development and psychometric evaluation of a functional communication measure for adult aphasia. *J Speech Lang Hear Res*. 1989; 54:113-124.
23. Katz R, Wertz R. The efficacy of computer-provided reading treatment for chronic aphasic adults. *J Speech Lang Hear Res.* 1997;40:493-507.
24. Elman R, Bernstein-Ellis E. The efficacy of group communication treatment in adults with chronic aphasia. *J Speech Lang Hear Res.* 1999;42:411-419
25. Sparks R, Holland A. Melodic intonation therapy. *J Speech Hear Disord.* 1976; 41:287.
26. Helm-Estabrooks N, Fitzpatrick P, Barresi B. Visual action therapy for global aphasia. *J Speech Hear Disord*. 1982;44:385-389.
27. Beeson PM, Hirsch FM, Rewega MA. Successful single word writing treatment. Experimental analyses of four cases. *Aphasiology.* 2002;16: 473-491.
28. Davis GA, Wilcox MJ. Incorporating parameters of natural conversation in aphasia treatment. In: Chapey R, ed. *Language Intervention Stragegies in Adult Aphasia..* Baltimore: Williams & Wilkins; 1991.
29. Basso A. Prognostic factors in aphasia. *Aphasiology.* 1992;6:337-348.
30. Swinburn K, Porter G, Howard D. *The Comprehensive Aphasia Test*. Hove, UK: Psychology Press; 2005.
31. Kaplan E, Goodglass H, Weintraub S. *The Boston Naming Test*. Boston, MA: Veteran's Administration; 1976.
32. La Pointe L, Horner J. *Reading Comprehension Battery for Aphasia*. Beaverton, OR: C.C. Publications Inc; 1979.
33. German D. *Test of Adolescent/Adult Word Finding.* Allen, TX: DLM Teaching Resources; 1990.
34. Paul-Brown D, Frattali CM, Holland AL, Thompson CK, Caperton CJ. *Quality of Communication Life Scales.* Rockville, MD: American Speech-Language Hearing Association; 2003.
35. Lear J, Sperry D. Self-assessment of communication skills. Ontario, Canada; 1997. (Unpublished assessment available from the authors.)
36. Cherney LR, Babbitt EM, Semik P, Heinemann AW. Psychometric Properties of the Communication Confidence Rating Scale for Aphasia (CCRSA): Phase 1. *Top Stroke Rehabil.* 2011;18:352-360.
37. Babbitt EM, Heinemann AW, Semik P, Cherney LR. Psychometric Properties of the Communication Confidence Rating Scale for Aphasia (CCRSA): Phase 2. *Aphasiology*. 2011;25: 727-735.
38. Kagan A, Simmons-Mackie N, Victor JC, et al. *Assessment for Living with Aphasia (ALA).* Toronto, Canada: Aphasia Institute; 2010.
39. Doyle DJ, Mikolic J, Prieto L, et al. The Burden of Stroke Scale (BOSS) provides valid and reliable score estimates of functioning and well-being in stroke survivors with and without communication disorders. *J Clin Epidemiol.* 2004;57: 997-1007.
40. Schlosser RW. Goal attainment scaling as a clinical measurement technique in communication disorders. A critical review. *J Commun Disord*. 2004; 37: 217-239.
41. Frattali C, Thompson CK, Holland AL, Wohl CB, Ferketic MM. *American Speech-Language-Hearing Association Functional Assessment of Communication Skills for Adults.* Rockville, MD: American Speech-Language Hearing Association; 1995.