Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is "None", please specify "None" as your response. "Not applicable" is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format. Questions? Contact Health Research Program staff at 717-783-2548.

1. **Grantee Institution**: Albert Einstein Healthcare Network

2. **Reporting Period (start and end date of grant award period):** 1/1/2010 – 12/31/12

3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Mary Klein, PhD

4. **Grant Contact Person's Telephone Number**: 215-456-7864

5. **Grant SAP Number:** 4100050886

6. **Project Number and Title of Research Project:** 2 - The Role of Left Inferior Frontal Cortex in Sequencing and Language

7. **Start and End Date of Research Project:** 1/1/2010 – 12/31/12

8. **Name of Principal Investigator for the Research Project:** Myrna F. Schwartz, PhD

9. **Research Project Expenses.**

9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

$ $40,573.83

9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project	Cost
Izbinsky	Research Asst	15% Yr 1	$5,576
Gagliardi	Research Asst	40% Yr 2	$15,365

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project
Schwartz	Principal Investigator	5%
Thothathiri	Post-Doc Fellow	50%

9(D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
None		

10. Co-funding of Research Project during Health Research Grant Award Period. Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes_____X____ No_____

If yes, please indicate the source and amount of other funds:

RO1 DC000191- $8,800
T32 HD07425 - $18,900

11. Leveraging of Additional Funds

11(A) As a result of the health research funds provided for this research project, were you able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes_____ No___X_____

If yes, please list the applications submitted (column A), the funding agency (National

Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If you have received a notice that the grant will be funded, please indicate the amount of funds to be awarded (column E). If the grant was not funded, insert "not funded" in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds to be awarded:
None	☐NIH ☐ Other federal (specify:_____) ☐ Nonfederal source (specify:_)		$	$

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?
Yes_____ No____X_____

If yes, please describe your plans:

12. Future of Research Project. What are the future plans for this research project?

Dr. Malathi Thothathiri, the project co-investigator, worked on this while a post doc in my lab. This past Fall, she took up a faculty position in the Speech & Hearing Sciences Department at George Washington University. She plans to continue this line of work and to apply for grants to support and expand it.

13. New Investigator Training and Development. Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one summer?

Yes_____ No_____X_____

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				
Female				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
White				
Black				
Asian				
Other				
Unknown				
Total				

14. Recruitment of Out-of–State Researchers. Did you bring researchers into Pennsylvania to carry out this research project?

Yes_____ No_____X_____

If yes, please list the name and degree of each researcher and his/her previous affiliation:

15. Impact on Research Capacity and Quality. Did the health research project enhance the quality and/or capacity of research at your institution?

Yes_____ No____X_____

If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

16. Collaboration, business and community involvement.

16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

Yes_____ No_____X_____

If yes, please describe the collaborations:

16(B) Did the research project result in commercial development of any research products?

Yes_____ No____X_____

If yes, please describe commercial development activities that resulted from the research project:

16(C) Did the research lead to new involvement with the community?

Yes_____ No_____X_____

If yes, please describe involvement with community groups that resulted from the research project:

17. Progress in Achieving Research Goals, Objectives and Aims.

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the progress during the course of the project.

Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure symbols print properly, e.g., the Greek symbol for alpha (α) and beta (ß) should not print as boxes (□) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.

Language production involves the conversion of a message or thought into a string of words. This process may include several component processes, including the selection of appropriate words, the sequencing of those words in a grammatical order, and the programming of articulatory motor movements. The left inferior frontal cortex (LIFC), which includes Broca's area, has long been associated with language production. However, contemporary research in cognitive neuroscience, primarily involving functional neuroimaging of neurologically normal individuals paints a more complex picture. The current view is that the LIFC is involved in high level aspects of language and cognitive control, and that there is considerable sub-specialization within LIFC. In this project, we explored the issue of LIFC sub-specialization from a neuropsychological perspective, with a focus on non-fluent aphasia.

Persons with mild or moderate non-fluent aphasia are able to function independently in many everyday situations, but they either avoid interactions that require prolonged or subtle spoken language communication or are dependent on others to "translate" for them in such situations. This can have a negative impact on psychosocial well-being and quality of life. This project investigated the possibility that an inability to flexibly sequencing words lies at the core of patients' grammatical difficulties. There were two project objectives:

Objective #1: To clarify the role of left inferior frontal cortex (LIFC) in sequencing for language.
Objective #2: To clarify the relationship between such sequencing impairments and deficits in other linguistic and non-linguistic functions.

We originally proposed to run a group study comparing patients with LIFC damage (n=10) to patients with damage outside of LIFC (n=10) and neurologically healthy controls (n=10). That plan was revised as we started to enroll patients and became aware of how few patients in our database met the specific anatomical criteria AND were capable of performing the experimental procedures in a reasonably error-free manner. Once we appreciated the problem, we switched to a single case design, and to a data analysis strategy that involves evaluating each patient against the mean of a control group (Crawford t-test). As described below, the final enrollment was 15 -- 7 patients, 8 controls.

In the following paragraphs, we summarize the methods and results in relation to the study's three specific aims.

Specific aim #1: To determine whether damage to a specific sub-region of LIFC (posterior portion, Brodmann area 44/6/9) is predictive of impairment in flexibly sequencing words.

The hypothesis we proposed to test derived from a finding obtained in our lab prior to the present project, which also provided an initial validation of the task used here. The task involved multiword priming. Participants produced two nouns in an "X and Y" phrase. We manipulated whether a repeated noun appeared in a consistent or inconsistent position compared to previous prime trials. We measured participants' difficulty in flexibly sequencing words by computing the increase in reaction time for inconsistent compared to consistent trials as a percent of baseline reaction times. A higher percent increase indicates greater difficulty in flexible sequencing.

Participants were 7 patients with stroke-related damage to different parts of the left hemisphere language cortices. All had mild or recovered aphasia, as measured by performance on standard aphasia tests. Four participants were of primary interest. These four (P2, P3, P4, P5 in Figure 1) had lesions restricted to LIFC, and they differed in which subareas of LIFC were affected. The remaining 3 had damage outside LIFC; they were included to control for general effects of brain damage. Only 1 was able to comply with instructions and/or provide useable reaction time data.

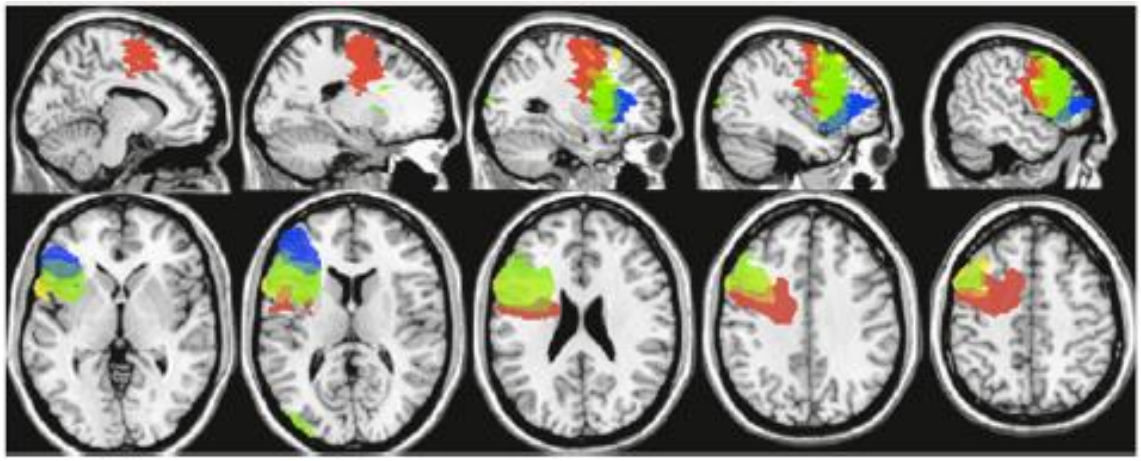

Figure 1: Lesion maps for the 4 patients with LIFC damage. P2's lesion is shown in red; P3's in yellow; P4's in green; and P5's in blue. Yellow+Green depicts the overlap between P3 and P4; Blue+Green the overlap between P4 and P5. Top: from left to right, medial to lateral sagittal slices at Montreal Neurological Institute (MNI) X coordinates = -10, -20, -30, -40 and -50. Bottom: from left to right, ventral to dorsal axial slices at MNI Z coordinates = 0, 12, 24, 36 and 48.

Eight healthy control participants were tested as well. One control was excluded from the data analysis when it was discovered that English was not this person's native language. We used the mean (4.36) and standard deviation (5.43) from the remaining 7 in a Crawford t-test to determine whether each patient's score was significantly different from the controls.

Table 1 shows the p values from this analysis in parentheses next to the reaction time measure. * indicates that the patient's score differs significantly from the control mean.

Table 1. Multiword priming scores

Patient #	Description of brain lesion	% increase in reaction time (inconsistent minus consistent)
1	No damage in LIFC. Posterior cortices only.	3.50 ($p>.05$)
2	Some damage to posterior LIFC	24.58* ($p<.01$)
3	Extensive damage to posterior LIFC	23.18* ($p<.01$)
4	Extensive damage to posterior LIFC	36.76* ($p<.01$)
5	Damage to LIFC, but not posterior parts	17.51* ($p<.05$)

The results are partially consistent with our predictions. As predicted, the non-LIFG damage patient (patient 1) did not have any particular difficulty with this task. Also as predicted, patients 2-4 (damage to posterior LIFC) had the most exaggerated difficulty. However, patient 5 (damage to another part of LIFC) also was significantly different from the controls. It is possible that patient 5's difficulty arises not from an impairment in flexible sequencing, but an impairment in overriding prepotent responses. Under specific aim #3, we discuss a sequencing task without a priming manipulation that was included to tease apart these mechanisms.

Specific aim #2: To correlate impairment in sequencing words with difficulty in producing complete, grammatical sentences during other tasks.

To evaluate whether the frontal patients who showed difficulty in flexible sequencing in the multiword priming task also showed difficulties in other language production tasks, we examined patients' performance on a variety of production tasks. Some, like verbal fluency and scene description, are standard in aphasia research. Others are more specialized evaluations that come out of the research literature; these include an analysis of grammatical production based on narrative story-telling, and a so-called "moving pictures task" that manipulates the short-term memory load early or late in sentences produced in response to pictures that move around on a screen.

Examination of the data revealed no relation between performance on the experimental measure (flexible word sequencing in the multiword priming task) and any of the other production measures, i.e., patients who performed poorly on the experimental task were no worse on the production measures than those who performed well. Assuming this dissociation can be confirmed in future studies with larger numbers of patients, a plausible hypothesis is that it is due to the semantic support for sequential word selection available in naturalistic situations but not in our experimental tasks..

Specific aim #3: To correlate impairment in sequencing words with impairment in sequencing non-linguistic items such as tones and visual stimuli.

A potential limitation of using the multiword priming task to index the ability to sequence words is that it is subject to the use of strategies. We therefore designed and implemented a new sequence manipulation task. Participants reproduced four-item sequences shown on the screen using the keyboard. Stimuli were letters (A, B, C), colored squares (blue, yellow, red) or color names ("blue", "yellow", "red"). Items appeared one at a time (sequential) or all at once (simultaneous). Healthy controls are known to slow down in the simultaneous condition for item 1 (cost for planning); but they go faster on subsequent items (benefit from planning ahead). In contrast, frontal patients may incur initial interference costs without reaping much subsequent benefit. We computed the difference between cost (item 1 simultaneous minus sequential) and benefit (item 2 simultaneous minus sequential), normalized by the baseline reaction time (RT) to item 1 in the sequential condition.

We only tested the four frontal patients (2-5) on this task because we were interested in exploring sub-specialization within the frontal cortex for those patients who had shown impairment in the

multiword priming task. We found patients with different frontal lesion profiles showed different patterns. Patient 2, who had the most damage to premotor cortex, showed substantial interference for all three types of stimuli (letters, colors, color names); this might reflect a general motor planning difficulty. Patient 5, with damage to anterior and not posterior frontal cortex, was within the control range for all three types of stimuli. Thus, her difficulty in the multiword priming task may have arisen from difficulty overriding a prepotent response and not difficulty in sequencing per se. Interestingly, patients 3 and 4, the two patients with posterior LIFG damage, showed a material specific pattern of impairment. These patients experienced exaggerated difficulty on the letters version of the task, but not the colors or color names versions. This pattern, together with their impaired multiword priming performance, suggests that they might have a difficulty in sequencing that emerges under particular conditions, namely when there is not much semantic support (as in the letters condition of the sequence task) and/or prior orders have to be overridden (as in the multiword priming task).

In conclusion: We collected data from four patients who comprise a select case series in that their lesions were small, focal, and distributed along an anterior- to-posterior axis within LIFC. This select case series affords a rare opportunity to map the control functions of LIFC. At the same time, the small number of cases limits the strength of conclusions. Future replications are needed to establish the reliability of the findings and determine their generality.

18. Extent of Clinical Activities Initiated and Completed. Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be "No."

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

__x___Yes
_____No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

___x__Yes
_____No

If "Yes" to either 18(A) or 18(B), items 18(C) – (F) must also be completed. (Do NOT complete 18(C-F) if 18(A) and 18(B) are both "No.")

18(C) How many hospital and health care professionals were involved in the research project?

_0____Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

___30___Number of subjects originally targeted to be included in the study
___15___Number of subjects enrolled in the study

Note: Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:
___6___Males
___9___Females
_____ Unknown

Ethnicity:
_____Latinos or Hispanics
_15___Not Latinos or Hispanics
_____Unknown

Race:
_____American Indian or Alaska Native
_____Asian
__7___Blacks or African American
_____Native Hawaiian or Other Pacific Islander
__8___White
_____Other, specify:_____
_____Unknown

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

Philadelphia and Montgomery Counties.

19. Human Embryonic Stem Cell Research. Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?

_____Yes

___x___ No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?

_____Yes

_____ No

19(C) Please describe how this project involved human embryonic stem cells:

20. Articles Submitted to Peer-Reviewed Publications.

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, the number of the publication and an abbreviated research project title. For example, if you submit two publications for PI Smith for the "Cognition and MRI in Older Adults" research project (Project 1), and two publications for PI Zhang for the "Lung Cancer" research project (Project 3), the filenames should be:

Project 1 – Smith – Publication 1 – Cognition and MRI
Project 1 – Smith – Publication 2 – Cognition and MRI
Project 3 – Zhang – Publication 1 – Lung Cancer
Project 3 – Zhang – Publication 2 – Lung Cancer

If the publication is not available electronically, provide 5 paper copies of the publication.

Note: The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1. Subdivision of frontal cortex mechanisms for language production in aphasia	Malathi Thothathiri, Maureen Gagliardi Myrna F. Schwartz	Neuro-psychologia	October 2011	☐Submitted ☐Accepted X Published

20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future? No

Yes_____ No_____X_____

If yes, please describe your plans:

21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project. Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

None

22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment. Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

None

23. Inventions, Patents and Commercial Development Opportunities.

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes_____ No____X_____

If "Yes" to 23(A), complete items a – g below for each invention. (Do NOT complete items a - g if 23(A) is "No.")

a. Title of Invention:

b. Name of Inventor(s):

c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):

d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____

If yes, indicate date patent was filed:

e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____
If yes, indicate number of patent, title and date issued:
Patent number:
Title of patent:
Date issued:

f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes_____ No____

If yes, how many licenses were granted?_____

g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes___ No____

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes_____ No____X_____

If yes, please describe your plans:

24. Key Investigator Qualifications. Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages. *For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

BIOGRAPHICAL SKETCH

NAME Myrna F. Schwartz, Ph.D.	POSITION TITLE Associate Director, Moss Rehabilitation Research Institute
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
New York University, New York, NY	BA	1968	Psychology
University of Pennsylvania, Philadelphia, PA	Ph.D.	1974	Psychology
Johns Hopkins School of Medicine, Balt., MD	Post-doc	1975-1977	Behavioral Neurology

Personal statement.
My 30+ year research career has been devoted to advancing the understanding and treatment of acquired aphasia by relating its varied symptom presentation to the computational, and neural architecture of the language system. My record of publications, service, and grant awards in these areas constitute strong qualifications for my role on this application. I am very pleased to have this opportunity to contribute to an innovative project, run by a talented young investigator.

A. Positions and Honors.

Previous & Present Academic and Hospital Appointments

1974-1976 Instructor, Swarthmore College.
1977-1979 Assistant Professor in Neurology, The Johns Hopkins University School of Medicine
1977-1979 Research Associate in Neurology, The Baltimore City Hospitals.
1979-1986 Assistant Professor of Psychology, University of Pennsylvania.
1986-2001 Associate Professor, PM&R, Temple University, School of Medicine
1992- Associate Director & Senior Research Scientist, Moss Rehabilitation Research Institute (also, Director, Neuropsychology Research Lab; Director of Research, MossRehab Aphasia Center)
2001- Research Professor of Physical Medicine and Rehabilitation, Thomas Jefferson University

Current Adjunct Appointments

1993- Adjunct Professor of Psychology, Temple University
1997- Adjunct Professor in Communications Sciences, Temple University
1999- Adjunct Professor in Speech-Language-Hearing Science Program, La Salle University, School of Nursing
2001- Adjunct Professor of Physical Medicine & Rehabilitation, Temple University

Honors and Awards

1997 J. Stanley and Helene M. Cohen Prize for Research (AEHN)
1997 Keynote address British Neuropsychological Society and British Psychological Society Special Group in Clinical Psychology. London.
1998 Invited address to the Academy of Aphasia
2003 Keynote address, British Aphasiology Society, University of Newcastle, U.K

2011 Keynote address, Southeastern Psychological Association (SEPA)

Professional Organization Memberships and Positions

Academy of Aphasia - Membership Committee (1990-2), Program Committee (1982-5), Board of Governors (1994-7); American Psychological Association (through 2009); International Neuropsychology Society; Psychonomic Society; Cognitive Neuroscience Society.

Grant Reviewing Responsibilities

Standing member NIH Sensory Disorders and Language Study Section, (1990-93)
Member NIDCD Programs Advisory Committee, (1996-98).
Member NIH Reviewer Reserve, (1993 – present)
Standing member NIDCD Communication Disorders Review Committee (CDRC) (2007-2011)
Ad hoc reviews for: NIDCD; Medical Research Council of Canada; Medical Research Council of Great Britain

Journal Editorial/Reviewing Responsibilities

Editorial Boards: Current – Cognitive Neuropsychology. Past - Cortex, Language and Cognitive Processes, Neuropsychological Rehabilitation**. Ad hoc reviewer** - Brain and Language, Neuropsychologia, Neurocase, Psychological Bulletin and Review, Journal of Memory and Language, International Journal of Neuropsychology, Aphasiology, Journal of Cognitive Neuorscience, others

B. <u>Selected Peer-reviewed Publications Relevant to the Proposal</u>

1. Dell, G.S., Schwartz, M.F., Martin, N., Saffran, E.M., & Gagnon, D.A. (1997). Lexical access in aphasic and nonaphasic speakers. *Psychological Review, 104,* 801-838.
2. Schwartz, M.F., Dell, G.S., Martin, N., Gahl, S., & Sobel, P. (2006). A case-series test of the interactive two step model of lexical access: Evidence from picture naming. *Journal of Memory and Language, 54*, 228-264.
3. Kimberg, D.Y., Coslett, H.B., & Schwartz, M.F. (2007). Power in voxel-based lesion-symptom mapping. *Journal of Cognitive Neuroscience, 19* (7), 1067-80.
4. Schnur, T.T., Schwartz, M.F., Kimberg, D.Y., Hirshorn, E., Coslett, H.B., & Thompson-Schill, S.L. (2009). Localizing interference during naming: Convergent neuroimaging and neuropsychological evidence for the function of Broca's area. *Proceedings of the National Academy of Sciences*, *106,* 322-327.
5. Schwartz, M.F., Kimberg, D. Y., Walker, G. M., Faseyitan, O., Brecher, A., Dell, G. S., & Coslett, H.B. (2009). Anterior temporal involvement in semantic word retrieval: VLSM evidence from aphasia. *Brain, 132* (12), 3411-3427.
6. Oppenheim, G.M., Dell, G.S., & Schwartz, M.F. (2010). The dark side of incremental learning: A model of cumulative semantic interference during lexical access in speech production. *Cognition*, 114, 227-252.
7. Schwartz, M.F., Kimberg, D.Y., Walker, G.M., Brecher, A., Faseyitan, O., Dell, G.S., Mirman, D. & Coslett, H.B. (2011). Neuroanatomical dissociation for taxonomic and thematic knowledge in the human brain. *Proceedings of the National Academy of Sciences, 108,* 8520-8524.
8. Middleton, E.L. & Schwartz, M.F. (2011). Density pervades: An analysis of phonological neighbourhood density effects in aphasic speakers with different types of naming impairment. *Cognitive Neuropsychology, 27,* 401-427.
9. Schwartz, M.F. & Dell, G.S. (2010). Case series investigations in cognitive neuropsychology. *Cognitive Neuropsychology*, 27, 477-494
10. Mirman, D., Strauss, T.J., Brecher, A., Walker, G.M., Sobel, P., Dell, G.S., & Schwartz, M.F. (2010). A large, searchable, web-based database of aphasic

performance on picture naming and other tests of cognitive function. *Cognitive Neuropsychology, 27, 495-504.*

11. Nozari, N., Dell, G.S., Schwartz, M.F. (2011) Is comprehension necessary for error detection? A conflict-based account of monitoring in speech production. *Cognitive Psychology*, 63, 1-33.
12. Thothathiri, M., Kimberg, D.Y., Schwartz, M.F. (2011). The Neural Basis of Reversible Sentence Comprehension: Evidence from Voxel-based Lesion Symptom Mapping in Aphasia, *Journal of Cognitive Neuroscience*. 24 (1), 212–222.
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15. Schwartz, M. F., Faseyitan, O., Kim, J., & Coslett, H. B. (2012) The dorsal stream contribution to phonological retrieval in object naming. *Brain*, 135, 3799-3814.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Thothathiri, Malathi	Assistant Professor, Speech and Hearing Science The George Washington University
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Indian Institute of Technology, Bombay	B.Tech	06/94	Metallurgical Engineering
Rensselaer Polytechnic Institute	M.S.	12/96	Materials Engineering
Harvard University	Ph.D.	08/08	Psychology
Moss Rehabilitation Research Institute and University of Pennsylvania	Post-doctoral fellow	09/08-09/10	Cognitive neuroscience and Neuropsychology

B. Positions and Honors

Positions and Employment

1997-1999	Software Engineer, Integral Engineering / Verid Technology Corporation, Maynard, MA
1999-2001	Senior Software Engineer, Artisoft Inc., Cambridge, MA
2001-2003	Senior Software Engineer, AniWorld Inc., Pasadena, CA
2005-2006	Teaching Fellow in Psychology, Harvard University, Cambridge, MA
2010-2012	Visiting Assistant Professor, Swarthmore College, Swarthmore, PA
2012-	Assistant Professor, The George Washington University, Washington, DC

Professional Memberships

2010-	Member, Association for Psychological Science
2010-	Member, Cognitive Neuroscience Society

C. Peer-reviewed Publications

1. Thothathiri, M., Gagliardi, M., & Schwartz, M. F. (2012). Subdivision of frontal cortex mechanisms for language production in aphasia. Neuropsychologia, 50, 3284-94.
2. Thothathiri, M., Kimberg, D. Y., & Schwartz, M. F. (2012). The neural basis of reversible sentence comprehension: Evidence from voxel-based lesion-symptom mapping in aphasia. Journal of Cognitive Neuroscience, 24, 212-222.
3. Thothathiri, M., Kim, A., Trueswell, J. C., & Thompson-Schill, S. L. (2012). Parametric effects of syntactic-semantic conflict in Broca's area during sentence processing. Brain and Language, 120 (3), 259-264.
4. Thothathiri, M., Snedeker, J., & Hannon, E. (2011). The effect of prosody on distributional

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5. Thothathiri, M., Schwartz, M. F., & Thompson-Schill, S. L. (2010). Selection for position: The role of left ventrolateral prefrontal cortex in sequencing language. Brain and Language, 113, 28-38.
6. Thothathiri, M., & Snedeker, J. (2008). Give and take: syntactic priming during spoken language comprehension. Cognition, 108 (1), 51-68.
7. Thothathiri, M., & Snedeker, J. (2008). Syntactic priming during language comprehension in three- and four-year-old children. Journal of Memory and Language, 58, 188-213.

D. Research Support

Completed Research Support

Faculty research support, Swarthmore College, 2011-2012 $1000
Language and Executive Function
The goal of this project was to examine links between language and executive function in different populations.

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