This is provided as an example proposal.

It is important that you follow the current guidelines.

The mentor letter has been removed.

A PROPOSAL TO STUDENT ENHANCEMENT AWARD REVIEW COMMITTEE

TITLE OF PROJECT: Using pupillometry to index cognitive effort in sentence processing in people with and without aphasia

NAME OF APPLICANT: Laura Roche Chapman

STATUS: _____ Undergraduate __X__ Graduate _____ Medical

CAMPUS/LOCAL ADDRESS: College of Health Sciences and Professions, Grover Center, OU

E-MAIL ADDRESS: lr161209@ohio.edu

DEPARTMENT: Communication Sciences and Disorders

EXPECTED GRADUATION DATE (Month and Year): Dec., 2017

RE-SUBMISSION: ___ YES (Original Submission Date _____) __X__ NO

PROPOSAL CATEGORY (select one):

_____ Life/Biomedical __X__ Social/Behavioral

_____ Arts/Humanities _____ Physical Sciences/Engineering

BUDGET: Total Request $5698.99

(May not exceed $6,000)

FACULTY MENTOR INFORMATION:

NAME: Brooke Hallowell

E-MAIL ADDRESS: hallowel@ohio.edu

CAMPUS ADDRESS: Grover Center W237, Ohio University

DEPARTMENT: Communication Sciences and Disorders

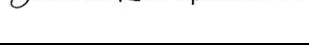
DEPARTMENT ADMIN./EMAIL: Teresa Tyson-Drummer, Tyson-dr@ohio.edu

IRB AND IACUC APPROVAL:

To ensure that the University is in compliance with all federal regulations, complete the checklist below. *Note: your proposal can be approved prior to IRB or IACUC approval (put "pending" or "to be submitted" instead of approval number), but funding will be withheld until notification of approval or exemption.*

Yes	***No***	***Office of Research Compliance***	***Policy #***
	X (to be submitted)	Human Subjects in Research (including surveys, interviews, educational interventions): Institutional Review Board (IRB) Approval #: Expiration Date:	19.052
	N/A	Animal Species: Institutional Animal Care & Use Committee (IACUC) Approval #: Expiration Date:	19.049

SIGNATURES

Applicant's Signature		**Faculty Mentor's Signature**	
Signature		Signature	
Name	Laura Roche Chapman	Name	Brooke Hallowell
Dept/School	Communication Sciences and Disorders, CHSP	Unit	Communication Sciences and Disorders, CHSP
Date	1/21/16	Date	1/21/16

☐ **Optional:** If selected for funding, I give permission to the Office of the Vice President for Research and Creative Activity to use my proposal as an example during training and workshop exercises. (Sign below)

Signature:  Date: 1/21/16

STUDENT ENHANCEMENT AWARD
APPLICATION CHECKLIST

Applicants **must** complete and sign the checklist. The checklist should be included as the second page of the application (following the cover page).

☒ Cover page	use SEA form
☒ Checklist	use SEA form
☒ Abstract*	1 double-spaced page
☐ ResubmissionSummary (***For Re-submissions Only***)*	1 double-spaced page
☒ Project Narrative	5 double-spaced pages
☒ Glossary/Definition of Terms* (***Not required***)	2 double-spaced pages
☒ Bibliography (***Not required***)	2 pages
☒ Presentation of Results	1 double-spaced page
☒ Mentor's Endorsement	1 page
☒ Biographical information (***Applicant(s) and key personnel***)	3 pages per person
☒ Budget and Justification	no limit specified (Including the OHIO-Affiliated Travel Form, if applicable)
☒ Appended Materials/Multimedia Files	5 pages; and no more than 10 minutes of footage
☒ Electronic copy of proposal	Single Acrobat file, containing entire proposal and required signatures

Sections marked with a bullet (*) identify text sections that should be written in language understandable by an informed layperson to assist the Committee in its review.

*****Please Note: The committee has the right to return without review any proposals that do not conform to these format requirements*****

Applicant signature: Laura R Chapman

Abstract

Cognitive effort refers to an intensity component of processing, or how *hard* the mind is working at any given time. There is evidence that effort may be what makes aphasia (a language disorder that typically follow stroke) so disabling for some individuals. Despite its potential theoretical and clinical relevance, effort is often overlooked in research and clinical examinations of language processing, which tend to examine participants' *performance* (in terms of accuracy and timing). This leaves us with an incomplete understanding of normal language processing and the nature of the deficits seen in disordered language processing.

Pupil dilation measured via pupillometry (measurement of pupil dilation and constriction during the performance of a cognitive task) reflects the magnitude of cognitive effort: more difficult tasks lead to larger pupil dilation than relatively easier tasks. The PI's master's thesis recently became the first published pupillometric study to include people with aphasia. Building on a strong foundation of work from the Ohio University Neurolinguistics Laboratory, the purpose of this project is to: 1) further develop and validate a pupillometric method for examining cognitive effort, and 2) examine cognitive effort during sentence processing in people with and without aphasia. This project will enhance the validity and sensitivity of language assessment by both considering cognitive effort, and by improving tasks with which language competence and performance are evaluated, addressing two important concerns in the literature. This represents a critical step towards better understanding relationships between cognitive effort, sentence processing, and aphasia. Carefully designed pupillometric methods will help highlight differences in effort between people with and without aphasia, as well as within people with aphasia, ultimately informing the development of better clinical and research language assessment options for people with aphasia and other language disorders.

Project Narrative

Background/Significance: Cognitive effort is conceptualized as an *intensity* component of processing: how *hard* the mind is working (Just & Carpenter, 1993; Kahneman, 1973), although specific terminology in the literature has varied (e.g., working memory/attention models use "resources"; models of word recognition use "activation", etc.). Pupil dilation measured as a function of time-locked events is a psychophysiological indicator of cognitive effort (Beatty & Lucero-Wagoner, 2000; Sirois & Brisson, 2014). **Task-evoked response of the pupil (TERPs)** quantify effort by capturing change between pupil diameter during a cognitive task and pupil diameter during a period of relative non-activity: more intense processing leads to larger TERPs. This intensity aspect of processing is often overlooked in language assessment.

Inclusion of a pupillometric measure of cognitive effort may improve the validity of language assessment, which typically entails **performance measures** (accuracy and timing). Performance measures are based on **secondary tasks (**verbal responses, pressing of buttons as a result of a decision, etc.), which represent the end result of processing. Effort is an internal process that *may* or *may not* leave a trace on end results; it is likely related to accuracy and timing, but also qualitatively distinct (Kramer et al., 2013). A measure of cognitive effort has theoretically and clinically important implications for understanding the nature of language deficits in **aphasia**, a language disorder that typically occurs following a stroke. Effort may be an important component of what makes aphasia so disabling (Christensen & Wright, 2014). Some believe that language deficits seen in people with aphasia (**PWA**) result from a deficit in resource allocation (a construct akin to effort; McNeil, Odell, & Tseng, 1991). However, these theories are supported by studies of performance measures, not effort/resources directly. In addition, PWA may be particularly influenced by secondary task demands, as they often have

concomitant deficits in attention, memory, motor, and visual systems (Hallowell, 2008; Murray, 2012). Pupillometric tasks can be virtually free of secondary tasks, reducing confounds.

Previous Studies: This project is built on a strong foundation of work in the Ohio University Neurolinguistics Laboratory, and is an important step towards development of a valid and sensitive method for examining effort in language processing. The PI's master's thesis was the first published pupillometric study to include PWA: both controls and PWA exhibited larger TERPs listening to difficult compared to easy nouns (i.e., a **difficulty effect**) (Chapman & Hallowell, 2015a). The PI's pre-dissertation project replicated and extended those results: young **controls** exhibited larger TERPs when listening to difficult nouns and sentences, compared to easy nouns and sentences, in both auditory-visual and auditory-only tasks (although results suggest auditory-only tasks may elicit more effort) (Chapman & Hallowell, 2015b, 2015c).

Specific Aims. The goals of the proposed project are to: 1) further develop and validate a pupillometric method for studying cognitive effort by methodically testing the construct validity of task development parameters, and 2) use this improved method to examine cognitive effort in sentence processing in people with and without aphasia. Experiment 1 addresses *Specific Aim 1*, to determine whether an explicit comprehension task influences TERPs during a sentence-processing task in controls. Results will inform the design of Experiment 2, which examines cognitive effort during sentence processing in controls and PWA. *Specific Aim 2* examines differences in cognitive effort between controls and PWA. *Specific Aim 3* examines relationships between TERPs and clinical measures of sentence comprehension and aphasia severity.

Innovation: This study is innovative in that it will be the first study ever to address sentence processing in PWA using pupillometry (only previously studied in controls). Also, it will be the first study to directly test whether **foil trials** are needed to elicit attention; secondary

tasks that may confound results will be eliminated. The content validity of TERPs during sentence processing will be studied for sentence types not studied before using pupillometry.

Method: Experiment 1. Some of our previous studies have incorporated foil trials (yes/no comprehension questions following 20% of sentences), with the rationale that they would help ensure focused attention. While data from foil trials were not included in analyses, it is unclear if they influenced the way individuals processed all sentences (e.g., by anticipating a foil or preparing a spoken response). If they do, the benefit of their use may be outweighed by their potentially confounding influence on results. Thus, it may be important not to include them.

Participants. Forty controls will be recruited from the Athens, OH community. Inclusion criteria are: age 18-40 (to minimize age-related influences on pupil diameter); native English speaker; high school education; no history of language, learning, or cognitive disorder, or traumatic brain injury; passing a hearing screening; and, cognitive status within normal limits, determined by the *Montreal Cognitive Assessment* (*MoCA*; Nasreddine et al., 2005).

Stimuli/Instrumentation (identical for both experiments). Forty easy (four types of **canonical sentences**) and 40 difficult (four types of **noncanonical sentences**) sentences, plus 16 foil sentences, were developed. We controlled word frequency, imageability, age of acquisition, and word/sentence length. Noncanonical sentences are difficult to process; a **syntactic movement operation** is needed to assign **thematic roles** to nouns. This holds for people of all ages, with or without language disorders (Montgomery & Evans, 2009; Thompson & Shapiro, 2005; Traxler, Morris, & Seely, 2002). A variety of sentence types enhances ecological validity (Table 1 in Appendix). The Eyegaze Eyefollower 2.0 remote pupil/corneal reflection system will measure binocular pupil movements at 120 Hz (LC Technologies, Inc., 2009). Custom software (Norloff & Cleveland, 2015) will extract dependent measures.

Procedure. After screenings, participants will complete two pupillometry conditions. *No-foil condition:* Pupillary responses will be measured as participants listen to half (40) of the sentences; no other task will be performed. *Foil condition:* Participants will listen to the rest (40) of the sentences, 20% will be followed by a yes/no comprehension question (data from foil trials not included in primary analyses). See Figures 1 and 2 in the Appendix for schematics of no-foil and foil trials. The no-foil condition will be presented first, to avoid anticipation of questions.

Analysis. **Mean TERP** will be calculated for each sentence by subtracting participants' **baseline pupil diameter** from the average pupillary responses for 2000ms, beginning at the onset of the verb in each sentence (see Figure 1 in Appendix). The rationale is that pupils dilate in response to cognitive demand; differences in demand between canonical and noncanonical sentences (as studied using other methods) appear at the verb, which triggers the syntactic movement operation and assignment of thematic roles. We will assess *Specific Aim 1* using a repeated-measures analysis of variance (ANOVA) with difficulty (canonical, noncanonical) and condition (no-foil, foil) as within-subjects factors. We expect a significant difficulty effect for both conditions. Results will inform the design of Experiment 2.

Experiment 2. Participants. One hundred participants (50 controls, 50 PWA) will be recruited from Athens, OH and Columbus, OH through a collaborative arrangement between the Neurolinguistics Laboratory and the OhioHealth Neuroscience Center (letter of support in Appendix). A power analysis based on data from Chapman and Hallowell (2015a) (effect size .15, alpha of .05, power = .80) projected a minimum required sample size of 94 (Faul, Erdfelder, Lang, & Buchner, 2007). Inclusion criteria are identical to those above, with an expanded age range of 18-89 (to better represent age range of PWA). PWA must exhibit: no history of speech/language impairment prior to stroke; time post-onset of two months; diagnosis of aphasia

from stroke verified via radiological reports. The *MoCA* will not be given to PWA (their scores are not valid due to reliance on language abilities; Cumming, Bernhardt, & Linden, 2011).

Procedure. *Experimental task:* Participants will listen to all 80 sentences (break after 40 sentences), with inclusion of foil trials based on results of Experiment 1. *Language assessments:* The sentence comprehension subtest of the *Verb and Sentence Test* (*VAST*; Bastiaanse, Edwards, & Rispens, 2002) will index sentence comprehension. Aphasia Quotient (AQ) portions of the *Western Aphasia Battery-Revised* (WAB-R; Kertesz, 2007) will index aphasia severity.

Analysis. Mean and **peak TERP** (calculated via baseline subtraction) and **latency to peak TERP** will be analyzed. Each variable will be analyzed independently as they likely reflect different aspects of processing (Janisse, 1977). *Specific Aim* 2 will be addressed via two-way repeated measures ANOVA, with group (control, PWA) as the between-subjects factor and difficulty (canonical, noncanonical) as the within-subjects factor. We expect difficult sentences to elicit greater TERPs than easy sentences for both groups, and also a group difference in TERPs. For *Specific Aim 3,* we expect a relationship between TERPs and performance on a traditional measure of sentence comprehension, assessed by correlation coefficients between TERPs and *VAST* scores. We also expect a relationship between TERPs and measures of aphasia severity, assessed by correlation coefficients between TERPs and indices of a) overall aphasia severity (*WAB-AQ*), and b) severity of auditory comprehension deficits (*WAB-AC*).

Broader impacts: Cognitive effort has important theoretical and clinical implications for the study of normal and disordered language processing. Pupillometric methods can improve the quality, validity, and sensitivity of language assessment by: 1) taking cognitive effort into consideration, and 2) reducing confounds in research and clinical assessment of language processing.

Glossary

Aphasia: "An acquired communication disorder caused by brain damage, characterized by an impairment of language modalities: speaking, listening, reading, and writing; it is not the result of a sensory deficit, a general intellectual deficit, or a psychiatric disorder" (Hallowell & Chapey, 2008, p. 3).

Baseline pupil diameter: A measure of pupil size while a participant is not engaged in active processing. These are collected for each participant and are used to calculate TERPs.

Canonical sentences: Sentences that follow traditional word-order patterns in English: subject-verb-object. Usually processed with little effort by speakers without language impairments.

Cognitive effort: An intensity component of processing, operationally defined by Just and Carpenter (1993) as the "rate of mental resource consumption to support processing or to maintain information in active storage" (p. 311).

Controls: Participants without neurological disorders.

Difficulty effect: Difference between TERPs measured during a difficult task (e.g., listening to noncanonical sentences) and a relatively easier task (e.g., listening to canonical sentences).

Foil trials: Trials designed to elicit attention and prevent boredom. In the current study, they are trials in which participants are asked questions to test their comprehension of the verbal stimuli.

Latency to peak TERP: The amount of time, in milliseconds, that it took for pupil diameter to reach its peak during a specific period of time; calculated separately for each sentence.

Mean TERP: The average of a task-evoked pupillary response over time; calculated by averaging pupillary responses during task engagement (i.e., while the participant is listening to the sentence), and subtracting the participant's baseline pupillary response.

Noncanonical sentences: Sentences composed with the object of the sentence appearing before the verb, and the subject of the sentence appearing after the verb. This is not typical in English, making noncanonical sentences more difficult to process than canonical sentences for people with aphasia (Bastiaanse, Edwards, Maas, & Rispens, 2003), and also adults without language impairments regardless of age (Ferreira, 2003).

Peak TERP: The peak pupillary response in a specific period of time; calculated by taking the single largest pupillary response during task engagement (i.e., while the participant is listening to the sentence), and subtracting the participant's baseline pupillary response.

Performance measures: Indices of a construct based on something the participant does overtly; most typically index accuracy and/or timing.

PWA: Participants with aphasia.

Secondary tasks: Tasks that require performance above and beyond the construct of interest (e.g., in an auditory sentence-comprehension task, pointing to a related visual stimulus item.

Syntactic movement operation: A mental operation that restores noun phrases in noncanonical sentences to their original, canonical, positions; this is done in order to assign thematic roles (Chomsky, 1986).

Task-evoked response of the pupil (TERP): "A time-locked averaged record of pupillary dilation and constriction occurring during the performance of a mental task" (Ahern & Beatty, 1981, p. 122).

Thematic role: The role that a noun phrase plays in relation to the action or state described by the verb in the sentence; in "The boy chased the girl", "the boy" plays the role of the doer of the agent, or doer of the action (i.e., the subject of the sentence).

Bibliography

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Presentation of Results

Results from different portions of this study will be submitted for presentation at multiple conferences as portions of data analyses are completed. As part of this proposal, results from Experiment 1 (and any available results from Experiment 2) will be submitted for presentation at the 2016 Annual Convention of the American Speech-Language-Hearing Association (ASHA), which will be held in Philadelphia, PA from November 16-19, 2016. The ASHA Convention is the premier annual event for speech-language pathologists, audiologists, and speech, language, and hearing scientists, bringing together more than 12,000 attendees annually. Attending the ASHA convention offers the PI ample opportunities to network with peers and potential future colleagues, and engage with leading researchers in related fields (e.g., aphasia, psycholinguistics, aging and communication, speech science, etc.). Dr. Hallowell is an honored Fellow of ASHA. Her history of involvement, along with her numerous research collaborations will facilitate networking for the PI at the convention. Presentation of results from the proposed study will enhance the recognized excellence of Communication Sciences and Disorders at Ohio University, and demonstrate the cutting-edge research emerging from the Ohio University Neurolinguistics Laboratory. Results from both experiments will also be presented at the annual Ohio University Student Research and Creative Activity Expo, and the College of Health Sciences and Professions Research Showcase, both in 2017.

This project is expected to result in at least one publication, with targeted submission(s) to the peer-reviewed journal, *Journal of Speech, Language, and Hearing Sciences*. This journal, which in which the results of the PI's master's thesis are published, is a leading journal in the area of language science.

Biographical Information

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EDUCATION

Ohio University – Athens, OH
Student of the Doctor of Philosophy program in Speech-Language Science Aug. 2011-present
Current GPA: 3.994
Anticipated graduation date: Fall 2017
Master of Arts – Speech-Language Pathology Aug. 2011

Michigan State University – East Lansing, MI June, 2009
Bachelor of Arts – Communicative Sciences and Disorders, Music

RELEVANT COURSEWORK

HSLS 603: Neuroscience of Communication
HSLS 624: Adult Neurogenic Language Disorders
HSLS 731: Working Memory in Children and Adults
CSD 8900: Attention and Cognition
CSD 8962: Working Memory, Cognition, and Language
CSD 8972: Using Eyetracking to Study Cognitive and Linguistic Processing
PSY 621: Statistics for Behavioral Sciences
PSY 622: Correlation and Regression
PSY 704: Cognitive Processes
PSY 748A: Neuropsychology 1
LING 570: Syntax
LING 6000: Exploring the syntactic structure of sentence in English-speaking individuals with aphasia (Directed Study)

SELECTED PEER-REVIEWED PRESENTATIONS

Chapman, L. R., & Hallowell, B. (2015, November). *Pupil size varies with syntactic difficulty in an auditory sentence processing task*. Poster session at the annual convention of the American Speech-Language-Hearing Association, Denver, CO.

Chapman, L. R. (2014, November). *Processing difficult linguistic stimuli evokes more cognitive effort: Evidence from pupillometry*. Poster session at the annual convention of the American Speech-Language-Hearing Association, Orlando, FL.

Hallowell, B., Montgomery, J., **Chapman, L. R**., Haghighi, M., Modayil, M., Dinh, A., & Rusli, Y. A. (2014, November). *Using pupillometry to index mental effort during cognitive and linguistic processing*. Seminar at the annual convention of the American Speech-Language-Hearing Association, Orlando, FL.

Chapman, L. R., & Hallowell, B. (2013, November). *Pupillometry and cognitive effort in linguistic processing: Impact of analytic methods*. Poster session presented at the annual convention of the American Speech-Language-Hearing Association, Chicago, IL.

Roche, L., & Hallowell, B. (2012, May). *A novel pupillometric method for indexing word difficulty in individuals with and without aphasia*. Poster session presented at the Clinical Aphasiology Conference, Lake Tahoe, CA.

Roche, L., & Hallowell, B. (2012, March). *Use of pupillometry with aphasia: A novel method.* Poster session presented at the annual convention of the Ohio Speech-Language-Hearing Association, Columbus, OH.

Roche, L., & Hallowell, B. (2011, November). *Pupillometric method for assessing comprehension in individuals with neurological impairments*. Poster session presented at the annual convention of the American Speech-Language-Hearing Association, San Diego, CA.

PUBLICATIONS

Chapman, L. R., Hassan, F. H., Modayil, M., Oommen, E., Park, T., & Horner, J. Responsible conduct of research: For students, by students. *Contemporary issues in communication sciences and disorders, 40*(Spring, 2013), 15-30.

Chapman, L. R., & Hallowell, B. (2015a). A novel pupillometric method for indexing word difficulty in individuals with and without aphasia. *Journal of Speech, Language, and Hearing Research.* Advance online publication. doi: 10.1044/2015_JSLHR-L-14-0287

Chapman, L. R., & Lee, C. (2015). Spoken word recognition in aphasia. *OSHLA E-Hearsay, 5*(1), 110-116.

Horner, J., Modayil, M., **Chapman, L. R**., & Dinh, A. *Waivers of liability in dysphagia management: Ethical and legal perspectives.* Manuscript under review.

Chapman, L. R., & Hallowell, B. (2015b). *Pupillometric evidence of cognitive effort corresponding to noun and sentence processing difficulty.* Manuscript in preparation.

Chapman, L. R., & Hallowell, B. (2015c). *Controlling for age as a potential confound in research involving older adults.* Manuscript in preparation.

AWARDS AND HONORS

Graduate Student Scholarship 2015
American Speech-Language-Hearing Association Foundation

Student Research Grant 2015
College of Health Sciences and Professions, Ohio University

Original Work Grant 2015
Ohio University Graduate Student Senate

Communicative Disorders Scholarship 2015
Sertoma

Student Poster Contest, First Place Award 2015
College of Health Sciences and Professions and Heritage College of Osteopathic Medicine Student Research & Creativity Showcase

Student Research Travel Award 2014
Annual Convention of the American Speech-Language-Hearing Association

Meritorious Poster Submission 2014
Annual Convention of the American Speech-Language-Hearing Association

Fall Conference Scholar 2013
Academy of Neurologic Communication Disorders and Sciences

Editor's Award 2013
Contemporary Issues in Communication Sciences and Disorders

Research and Scholarly Activity Presentation Award 2011, 2013, 2014
College of Health Sciences and Professions, Ohio University

Graduate Student Travel Award 2011, 2013
Communication Sciences and Disorders, Ohio University

Student Poster Contest, First Place Award 2012
Ohio University Student Research and Creativity Expo

Student Poster Contest, Second Place Award 2012
Ohio Speech-Language Hearing Association

Outstanding Graduate Clinician 2011
Ohio University Speech, Language, and Hearing Clinic

Master's Research Award 2011
Plural Publishing & Council of Academic Programs in Communication Sciences and Disorders

OTHER FUNDING SOURCES

Received
College of Health Sciences and Professions Student Research Grant (*Received Dec. 2015; $500*)

Applied/will apply for:
Ohio University Student Enhancement Award (*Due Jan. 2016; $6000*)
College of Health Sciences and Professions Gary S. Neiman Graduate Student Research Award (*Due Jan. 2016; $500*)
Council of Academic Programs in Communication Sciences and Disorders Ph.D. Scholarship (*Due Jan. 2016; $20,000*)
Graduate Student Senate Original Work Grant (Resubmission) (*Due Feb. 2016; $750*)
Plural Publishing Ph.D. Doctoral Research Award (*Due Feb. 2016; $3000*)

Budget

	Item	Source	Cost per item	Total
A. Consumable Supplies – N/A				
B. Travel – Data collection				
Transportation	Round trip to OhioHealth NeuroScience Center	http://www.ohio.edu/finance http://google.com/maps	$0.54/mile x 83.9 miles x 2, est. 15 trips	$1359.18
	Round trip from hotel to Neuroscience Center	http://google.com/maps	$0.54/mile x 11.9 miles x 2, est. 8 trips	$102.82
Lodging	Hotel stay near OhioHealth Neuroscience Center	http://www.redroofcolumbus.com/	Appx $100/night, est. 8 stays	$800
			Total	**$2262.00**
B. Travel – Conference				
Transportation	Round trip to Columbus Airport	http://google.com/maps	$0.54/mile x 82.4 miles x 2 (round trip)	$88.99
	Airfare to Phila., PA	http://www.orbitz.com	(estimate)	$400
Lodging	Hotel Stay	(estimate)	5 days, 4 nights	$1200
Meals	Per diem	www.gsa.gov/perdiem	$64 per day x 5 days	$320
Other	Registration	http://www.asha.org/Events/convention/Registration-Fees/	ASHA Grad Student Member	$215.00
			Total	**$2223.99**
C. Equipment – N/A				
D. Other				
	Participant Payments		$10/ controls (x 90) $15/ PWA (x 50)	$1650
	Printing study materials		.03 per sheet (2100 sheets)	$63
			Total	**$1713.00**
Budget Summary				**Total**
	Total: Consumables		$0	$0
	Total: Travel		$4485.99	$4485.99
	Total: Equipment		$0	$4485.99
	Total: Other		$1713.00	$6198.99
Available Funds	CHSP Research Grant		$500.00	$5698.99
Amount Requested from SEA				**$5698.99**

Budget Justification

Travel to OhioHealth Neuroscience Center in Columbus, OH: In order to support the large number of PWA targeted for this study, as well as broaden the demographic characteristics of participants in this study, data collection will take place in Columbus at the OhioHealth Neuroscience Center. The Neuroscience Center joins Riverside Methodist Hospital, Grant Medical Center, Doctors Hospital, Grady Memorial Hospital, Dublin Methodist Hospital, Hardin Memorial Hospital, Marion General Hospital, O'Bleness Hospital, MedCentral Mansfield Hospital, MedCentral Shelby Hospital, Westerville Medical Campus and numerous outpatient centers in providing neuroscience expertise and offering ample recruitment opportunities for participants with aphasia meeting the criteria for the work proposed. The OhioHealth Research institute and an affiliated consulting neurologist have already agreed to provide space for data collection and assist with participant recruitment and medical record review at no cost.

Lodging near OhioHealth Neuroscience Center: In order to allow for the fewest trips possible to Columbus, lodging for a limited number of overnight stays is requested. This will enable the PI to schedule groups of participants for data collection. Also, this will enable the PI to schedule participants early in the morning and/or late at night to accommodate participants' schedules.

Travel to Philadelphia, PA for the ASHA Convention: Funding is requested to attend the 2016 ASHA convention. See Presentation of Results for details regarding the merits of this convention. This category currently represents more than one-third of the total requested award. However, the PI typically saves money by sharing lodging costs with other colleagues attending the convention; total savings to be determined depending on the number of colleagues accepted. Additionally, best estimates are provided for airfare and hotel costs; actual costs may be lower.

Participant payments: All participants will be paid for participation. PWA will be compensated $5 more than control participants because the total experiment time will be longer for these participants: PWA must complete the WAB subtests, which take 30-45 minutes to complete. If participants do not pass the initial screening, they will not be compensated. If they do pass, but choose to end participation during the study, they will be compensated the amount prorated according to the proportion of the study they have completed.

Study materials: Each participant will be given a consent form to read and sign prior to study participation. Other study materials include: health screening forms, cognitive screening forms, *VAST* and *WAB* forms, and data tracking sheets.

Appendix

Table 1

Examples of chosen sentence types

Sentence type	Canonicity	Example
Unergative	Canonical	The mother snored.
Unaccusative	Noncanonical	The mother floated.
Active	Canonical	The girl kicked the boy.
Passive	Noncanonical	The boy was kicked by the girl.
Subject-cleft	Canonical	It was the mother who kicked the father.
Object-cleft	Noncanonical	It was the father who the mother kicked.
Subject-subject	Canonical	The boy who kicked the mother carried the girl.
Subject-object	Noncanonical	The mother who the boy kicked carried the girl.

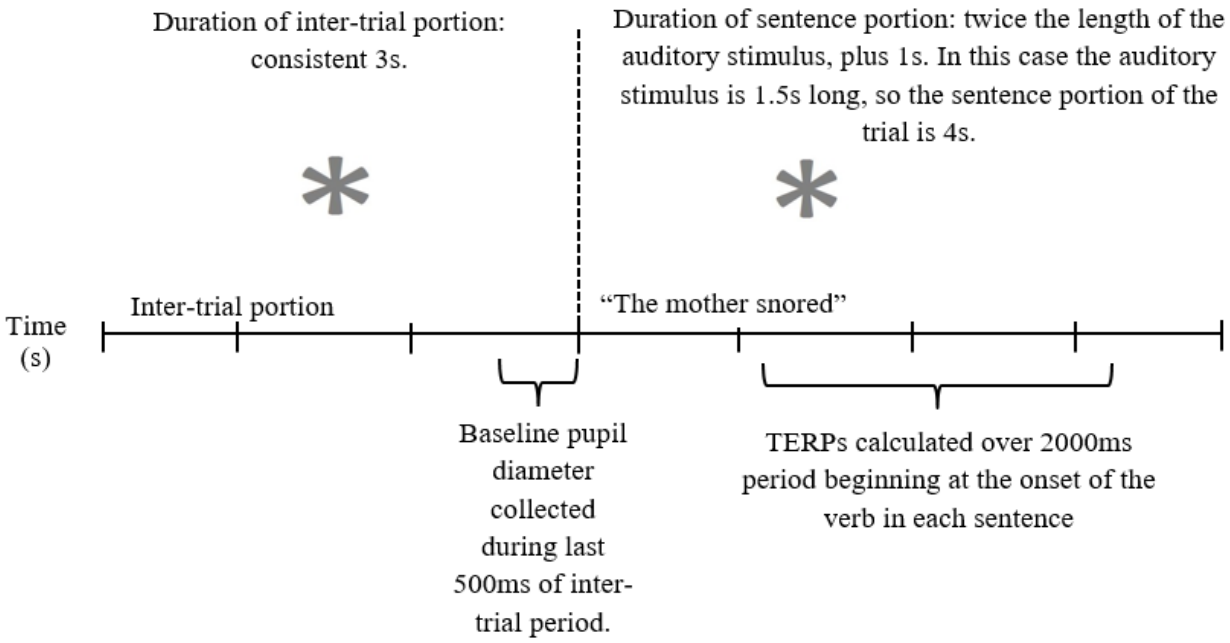

Figure 1. Schematic depiction of one no-foil trial from the pupillometric sentence-processing task.

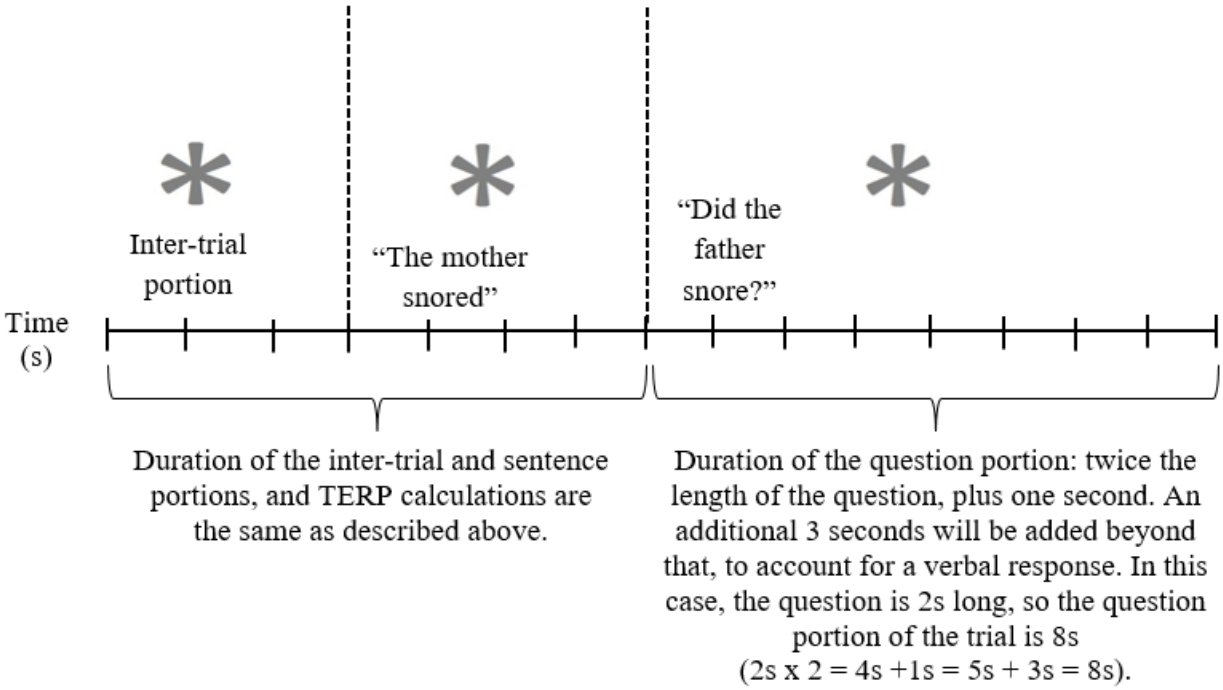

Figure 2. Schematic depiction of one foil trial from the pupillometric sentence-processing task.

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July 20, 2015

Re: Letter of Support

To Whom It May Concern:

As the Corporate Director of the OhioHealth Research and Innovation Institute (OHRI), I am excited to support Laura Chapman's proposed NIH predoctoral research project examining cognitive effort in linguistic processing in people with and without aphasia. OHRI has an established partnership with Ohio University, which includes a mutual recognition of IRB approval and commitment to share excellence in clinical translational research.

Our ongoing partnership with Prof. Hallowell and the Ohio University Neurolinguistics Laboratory, enlivened by this project, will be beneficial for Ms. Chapman's career development, Ohio University, and OHRI. I have every confidence that the highly professional staff at OHRI will facilitate the proposed work, through assistance with IRB approvals, participant recruitment, and general coordination of communications and scheduling.

The new OhioHealth Neuroscience Center at Riverside Methodist Hospital is an ideal setting for the proposed research project, with stroke survivors being referred from a variety of local facilities including 21 stroke network hospitals and a countless number of non-stroke network hospitals throughout Ohio.

The new OhioHealth Neuroscience Center provides subspecialized neuroscience care teams and treatment options for highly complex neuroscience conditions. In one location, patients can receive a complete range of care, such as inpatient and outpatient treatment, neurodiagnostics, interventional procedures, research clinical trials, surgery, and education.

Dr. Jennifer Mejilla, the consultant neurologist, has a great deal of experience in clinical practice with stroke patients, as well as treating patients through national clinical trials. She has also initiated her own personal clinical research at the Neuroscience Center, in conjunction with OHRI. I am sure that she will be supportive throughout the project.

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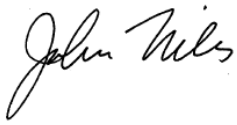
In closing, we enthusiastically support Ms. Chapman's project, and look forward to the prospect of participating on this research endeavor.

Sincerely,



John Niles, Corporate Director
OhioHealth Research and Innovation Institute