

## UNDERGRADUATE RESEARCH LONG TERM GRANT APPLICATION Budget Worksheet

BUDGET ITEM	Department or College Funds	Outside Agency Funds	Personal Funds	Undergrad. Research Funds	GRAND TOTAL
Materials	WSU Psychology Dept. will provide Brain Workshop n-back memory training software for computers.	XXX		AWMA – Working Memory Software Kit. \$751.25  \$250 for 50 \$5 participant gift cards.	\$1001.25
Equipment	WSU Psychology Dept. will provide 5 laptop computers.	Midland Elementary School will donate lab computers to be used by participants.	XXX	XXX	\$ 0.00
Stipend: Hrs @ \$10/hr Benefits @ 8.5% Total	XXX	XXX	XXX	XXX	\$0.00
Mileage to gather Data (.36 per mile)	XXX	XXX	I will provide my own gas/mileage expenses. 30 miles round trip Midland Elementary to WSU. 30 miles X 27 (trips) @ .36 = \$291.60	XXX	\$291.60
GRAND TOTAL	\$0.00	\$0.00	\$291.60	\$1,001.25	\$1,292.85

# UNDERGRADUATE RESEARCH LONG TERM GRANT APPLICATION

## Body of Proposal

### Project Description

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(Approximately 2 pages)

#### Research Question:

Does n-back task training improve the working memory capacity of 7-9 year old school children?

Poor working memory capacity has been shown to be related to learning difficulties in reading, math, and other cognitive tasks in school aged children. Findings by researchers support the idea that poor working memory capacity plays a significant role in one's ability to learn (Gathercole & Alloway, 2006). Working memory has been researched extensively by Alan Baddeley (1986), who found that working memory capacity is needed by the learner to hold the necessary information to be processed in memory long enough for cognitive connections and understanding to occur. Much of the working memory capacity research has included the effects that working memory capacity can have on reading abilities, and its relation to learning disabilities (Masoura, 2006). It is now known that multiple factors come into play when a child learns. Working memory capacity is an important factor of the learning process. Susan Gathercole (2008) discusses the prevalence of Poor Working Memory Capacity in school children and the need for early assessment and intervention, however, there is more research needed regarding how we should go about improving the working memory of those in need. Recently computerized training programs have been used in an attempt to improve working memory with some success. Rather than relying upon a trained professional to administer task training, computers can be used to provide the training for participants (Holmes, Gathercole, & Dunning, 2009). Computerized training will be used in this study that was designed to increase the working memory of participants who are public elementary school children ages 7-9. The working memory capacity of each participant will first be assessed using the Automated Working Memory Assessment-AWMA (Alloway, 2007). The AWMA consists of verbal and

visuo-spatial memory tests that reliably measure significant elements of working memory. It can be administered easily and is user friendly. Following the assessment, two randomly chosen groups will then be created. One group (experimental) will receive the working memory training intervention, which is designed to increase working memory capacity. The other group (control) will play low level educational games that do not place demands directly upon working memory capacity. The experimental group will play a computerized working memory training program called Brain Workshop. This program is an n-back based task. N-back tasks have been well researched to elicit demands upon working memory by requiring the participant to recall a previously heard and or seen stimulus occurring *n* number of stimuli previously (Cicerone 2002). The aim is to attempt to improve the working memory capacity of the experimental group using the simultaneous visual and auditory n-back (dual n-back) training. After completing the five week working memory training, the working memory capacity of each participant will be reassessed, and again 3 months later. Results are expected to show that n-back training increased the working memory capacity in participants. Working memory capacity is needed for the cognitive manipulations involved in various learning tasks; therefore, increasing the working memory capacity of school children with poor working memory capacities could increase their learning abilities.

### Research References

- Alloway, T.P. (2007). *Automated working memory assessment*. London: Harcourt Education.
- Baddeley, A.D. (1986) *Working memory*. Oxford: Oxford University Press.
- Cicerone, K.D. (2002). Remediation of 'working attention' in mild traumatic brain injury. *Brain Injury*, 16, 185-195.
- Gathercole, S.E., & Alloway, T.P. (2008). *Working memory and learning: A practical guide for teachers*. California: SAGE Publications Inc.
- Holmes, J., Gathercole, S.E., & Dunning, D.L. (2009) Adaptive training leads to sustained enhancement of poor working memory in children. *Developmental Science*, 12, F9-F15.
- Jaeggi, S.M., Buschkuhl, M., Jonides, J., Perrig, W.J. (2008). Improving fluid intelligence with training on working memory. (<http://iapsych.com/articles/jaeggi2008.pdf>), *Proceedings of the National Academy of Sciences*, 105, 6829-6833.
- Masoura, E.V. (2006). Establishing the link between working memory function and learning disabilities. *Learning Disabilities: A Contemporary Journal*, 4, 29-41.

I will be working closely with my faculty mentor, Dr. Lauren Fowler. She will be helping to guide me through the research process. I will be doing the assessments and collecting the data under the direction of Dr. Fowler. Together we will analyze the collected data.

The previous experience I have includes: I have taken all the psychology major courses needed for graduation including Research Methods, Intro to Neuroscience, Cognition, Biopsychology, Child Psychology, and Statistics. I did a related directed readings course researching the implications of neuroscience on education. For practicum I interned at Davinci High School assisting the counselor with academic advisement and SEOPs of students. I also have work experience assessing and tutoring children.

I am hoping a scholarly paper will result from this research project. It is my hope to submit this research and present it at NCUR, WSU Undergraduate Research Symposium, and University of Utah Leadership Symposium.

#### Project Methods & Timeline

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(Approximately 1 page)

**PARTICIPANTS:** Study participants will be Midland Elementary school students ages 7 to 9. Consent forms will be received from parents, teachers, and the principal. Each participant will be randomly placed into one of two groups. Group 1 (experimental group) will receive a working memory training intervention, and group 2 (control group) that will not receive the training.

METHOD: There will be pre and post testing of the participants, and there will be a control and experimental group. The study will consist of two randomly formed groups. Each group will first be assessed for their current working memory capacity (This step will take place in November 2009) using the Automated Working Memory Assessment-AWMA (Alloway 2009). After the assessments, one group (experimental) will receive the computerized working memory training intervention called Brain Works, and the other group (control) will play low level educational games that do not place demands directly upon working memory capacity (This step will take place in November and December of 2009). The training will be performed 3 days a week for 20 minutes for 5 five weeks. After completing the five week WM training the students' WMC will be reassessed, and again 3 months later (The reassessment will take place in March of 2009). A 2 (experimental/ control) x 2 (pre/post) ANOVA design will be used to assess the effects of the training on working memory (Data analysis will take place in January and March of 2009). Results are expected to show that n-back training increased the working memory capacity in participants. Working memory capacity is needed for the cognitive manipulations involved in various learning tasks; therefore, increasing the working memory capacity of school children with poor working memory capacities could increase their learning abilities.

This research project does involve human subjects, therefore it does have to be reviewed and approved by the WSU Institutional Review Board. This project has been approved by the WSU Institutional review Board.

Materials:

The undergraduate dollars requested for this category are \$1,001.25. A working memory kit is needed to assess the study participants. Automated Working Memory Assessment-AWMA is the working memory assessment kit we are seeking funding for (see attached print out). It is a well researched and developed assessment that consists of various verbal and visuo-spatial memory tests. It also provides feedback about strengths and weaknesses of the student being assessed. The cost of the kit is \$701.25 plus \$50 for shipping. The kit includes a CD, a working memory reference book, and a scorebook to keep track of each participant's progress. Funds are also needed to provide Wal-Mart gift cards to study participants upon completion of the study. We are requesting \$250 for this expense (50 participants @ \$5 = \$250). Therefore, the total undergraduate dollars requested for materials is \$1,001.25 (\$751.25 + \$250).

Equipment:

The WSU Psychology Department will provide 5 laptop computers to be used for the participant assessments. Midland Elementary will provide lab computers for the memory training sessions of participants.

Student Travel for data collection:

I, the student, will provide gas/travel expense to and from Midland Elementary School throughout the study. It is 15 miles from Weber State to Midland Elementary (Roy, UT). Round trip is 30 miles. It will take a minimum 27 round trips to complete the study. There will be the initial assessment 4 trips. There will be the five weeks of training sessions that are held 3 times a week for 5 weeks = 15 trips. Then there will be another assessment – 4 trips. There will also be a follow up assessment – 4 trips. This be a total of 27 round trips. This expense totals \$291.60 (30 miles @.36 X 27 trips).

Student travel to present research:

I, the student, have submitted a travel grant application for NCUR. I am planning to drive to the NCUR conference in Missoula, Montana and present my research. I am planning to stay in a hotel during the conference.

Stipend:

No undergraduate dollars are requested for stipend.