

## **Basak's Annual Report (April, 2017)**

The aim of our project is to understand how two different genres of video game learning (strategy game vs. action game) are related to different cognitive abilities, brain structure and brain function in healthy older adults and MCI patients. We had collected data on 26 healthy older adults prior to receiving funding, and with the funding, recruited additional 14 healthy older adults and 3 MCI adults till date. In sum, we have a total of 38 healthy older adults on whom we have all the measures across the multiple testing days; these measures include the two types of game learning, brain imaging and neuropsychological variables. This number gives us enough power to run any group-level and individual differences analyses. We have three journal manuscripts from this dataset: First on white matter connectivity and illusory conjunctions (Qin et al., 2016); second on age-related differences in brain activity at task-switching (Nashiro et al., under review), and third on age-related differences in functional connectivity in three different cognitive tasks (O'Connell & Basak, under review). Directly pertaining to the grant, we have a paper under review where we evaluated whether there are different cognitive markers and biomarkers of two different types of video game learning—action vs. strategy (Ray et al., under review). We are writing two more papers pertaining to this data set on game learning and biomarkers, which we expect to submit to peer-reviewed journals by Summer of 2017.

We had also proposed collection of pilot longitudinal data to see if strategy game learning can engender greater benefit to both cognitive and brain function in older adults. In addition to our previously collected data, with the funding from Darrell K Royal Foundation for Alzheimer's Disease we have added 40 individuals who underwent either word puzzle training or strategy video game training. In total, we have about 66 participants who were recruited for this training study, we have neuroimaging data on 47 participants. This study is expected to yield multiple papers including behavioral, brain activity during 2 fMRI tasks, resting state fMRI and DTI data. We aim to submit results from this data by summer of 2017 to peer-reviewed journals for publications. The preliminary findings with 38 participants were presented by Dr. Basak at ICPS 2015 in Amsterdam, Netherlands in March, 2015 (<http://icps.psychologicalscience.org/>) and at the American Psychological Association, August 2015 in Toronto, Canada. Preliminary behavioral data were presented at a plenary session of the Annual Meeting of Psychonomic Society, Nov, 2015 by Dr. Basak, which is a rare honor (<http://www.psychonomic.org/annual-meeting>). This honor was repeated in 2016's Annual Meeting of Psychonomic Society when Dr. Basak presented secondary analyses of the neurocognitive data at a plenary session on skill acquisition.

In sum, 2016-17 has been a very productive year for us with regards to this project funded by the DKR foundation for Alzheimer's disease. We have completed the data collection on healthy aging, and are currently focused on disseminating the results through conferences and journal publications. In addition to what we had proposed in the DKR grant, we have also made inroads on testing the cognitive and brain plasticity hypothesis, such that we now have reasonable pilot data on two arms of our training study – strategy game and word puzzles. This data set has

enabled us to apply for federal funding in 2017, where we have requested funding for a larger-scale study to evaluate long-term effects of training on different types of video games that vary in complexity.

I thank DKR foundation for their generous support, and hope for continued support in future.

Sincerely,  
Dr. Chandramallika Basak  
Assistant Professor  
University of Texas at Dallas

### **Peer-Reviewed Publications**

#### ARTICLES IN REFEREED JOURNALS

1. Qin, S., Ray, N.R., Ramakrishnan, N., Nashiro, K., O'Connell, M.A., & **Basak, C.** (2016) Illusory conjunctions in visual short-term memory: Individual differences in Corpus Callosum volume and splitting attention between the two hemifields. *Psychophysiology*, 53 (2016) 1639–1650. doi:10.1111/psyp.12735

#### UNDER REVIEW/SUBMITTED

2. Ray, N., O'Connell, M.A., Nashiro, K., Smith, E.T., Qin, S., & **Basak, C.** (revision submitted). Evaluating the relationship between white matter integrity, cognition, and varieties of video game learning. *Restorative Neurology and Neuroscience*.
3. Nashiro, K., Qin, S., O'Connell, M.A., & **Basak, C.** (under review). Age-related Differences in BOLD Modulation to Cognitive Control Costs in a Multitasking Paradigm: Global Switch, Local Switch, and Compatibility-Switch Costs. *NeuroImage*.
4. O'Connell, M.A. & **Basak, C.** (under review). Effects of Task Complexity and Age-differences on Task-Related Functional Connectivity of Attentional Control Networks. *Journal of Cognitive Neuroscience*.

### **Accepted Talks at Conferences**

1. **Basak, C.**, Nashiro, K, O'Connell, M.A., & Qin, S. (July 2017). *Playing for Keeps: Effects of Video Game Training on Neural and Cognitive Plasticity in Older Adult*. Symposium: Inducing cognitive and brain plasticity in older adults, 21<sup>st</sup> IAGG World Congress, San Francisco, July 2017.
2. **Basak, C.** *Benefits of cognitive training in healthy aging and MCI: A comprehensive meta-analysis.* (April 2017). Overview presentation of the Cognitive Plasticity section, 4<sup>th</sup> International Aging and Cognition Conference, Zurich, Switzerland,
3. **Basak, C.**, O'Connell, M.A., & Druskis, M. (Nov 2016). *What's your game? Game playing strategy interacts with video game learning and cognitive gains in older adults.* Presented at the Annual meeting for Psychonomic Society, Boston, MA.

4. **Basak, C.**, Nashiro, K., O'Connell, M.A., Chen, X., & Qin, S. (Nov, 2015). *RTS video game training in older adults: Immediate and long-term cognitive gains, and individual differences in gaming*. Presented at the Annual meeting for Psychonomic Society, Chicago, IL.
5. Qin, S., Nashiro, K., O'Connell, M.A., Chen, X., & **Basak, C.** (*Nanosymposium*, Society for Neuroscience, Chicago, IL, Oct 2015). *Age-related differences in task load, response compatibility and selective attention in task switching: An fMRI study*.
6. **Basak, C.** (March, 2015). Playing for keeps: Real-time strategy game training, aging brain and cognition. Symposium conducted at the meeting of the ICPS, Amsterdam, Netherlands.
7. **Basak, C.**, O'Connell, M., Qin, S., Nashiro, K., Chen, X., & Druskis, M. (August, 2015). Cognitive and neural plasticity from video game training. In Tom Heinzen (Chair), *Only a Game? The Promise of Gaming to Advance Health, Education, and Longevity*. Symposium conducted at the meeting of the American Psychological Association, Toronto, Canada.

Posters from this project are not listed as there are many.