Important note: The information provided here is a summary of the main points discussed in the text. For a full understanding, please refer to the original text.

**Improvement of visual attention through a web-based training program**

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**Introduction**

Though many studies have identified effective methods to improve cognitive abilities [1,2,3], most people do not have access to these methods. We developed a web-based game-like program that makes cognitive training accessible to a larger audience. The program is composed of five discrete exercises. Each exercise was specifically developed to train one or more cognitive functions. Key components of the program are:

- Dynamic difficulty changes to constantly challenge each individual and enhance their progress
- Web-based platform ensures ease and ubiquity of access
- Game-like features and motivations (such as scoring, unlocking of levels, etc.) transform a tedious training task into an entertaining game, leading to better compliance and more effective training
- Simple self-instruction: No human trainer required

The goal of this pilot study is to explore the effectiveness of the visual attention component of the program.

**Training Program Description**

The training program consists of a set of exercises designed to train and improve attention, working memory, processing speed, and executive function. The program is composed of five discrete exercises. Each exercise was specifically developed to train one or more cognitive functions. Key components of the program are:

- Dynamic difficulty changes to constantly challenge each individual and enhance their progress
- Web-based platform ensures ease and ubiquity of access
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The Birdwatching game is designed to increase the spatial extent of visual information that can be processed in a short amount of time.

**Methods**

**Single-arm design**

- **Trained Participants**: Pre-test (1 session) / Training (daily for 5 weeks) / Post-test (1 session)

- **Control Participants**: Pre-test (1 session) / no contact for duration of training / Post-test (1 session)

**Volunteers/Participants:**

- **Trained**: n = 14 (6 females), mean age = 57
- **Control**: n = 9 (2 females), average age = 49

Recruited by email from various locations across US

**Training**

Each user trained alone without guidance using personal computer

- Once daily for 5 weeks. Average number of sessions = 33, duration of each session = 5.5 min (excluding within 20 minute cognitive program), trials per session = 85

**Assessment**

- Pre- and Post-assessment is a web-based test of divided attention and processing speed. Users must simultaneously identify central stimulus and localize peripheral stimulus during 100ms presentation.

**Results**

- **Trained participants improved significantly**

- **Training reduced average error in localization of transient, non-central stimulus (p<.004, two-tailed t-Test)**

- **There was no significant change in average error in the control group**

- **Improvement greatest on most difficult stimuli**

- **No significant changes were observed in the control group**

- **Post-assessment: Trained participants performed better than controls in the untrained test of visual attention.**

**Discussion**

- All participants were able to use the testing and training software from a personal computer without guidance.
- Compliance and qualitative feedback suggests that the game structure motivates frequent training (see poster: “Working memory improvement following web-based cognitive training”)
- Trained subjects improved at the visual attention exercise (data not shown)
- Trained subjects also improved at the untrained visual attention test, suggesting that the program drives improvement that generalizes to other measures of visual attention and processing speed.

The results of this pilot study indicate that training and improving a fundamental cognitive ability such as visual attention is possible with a web-based application. The study also demonstrates the viability of conducting an entire study online, including intervention and assessment. We invite other researchers to consider or discuss potential applications to their own human behavior research.

**References**


The Lumos Labs cognitive training program can be accessed at [http://www.lumoslabs.com/](http://www.lumoslabs.com/)

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**LumosLabs.com**