

Title of Project: Using Real-world Images to Develop an Unconstrained Neural Network for Contour Integration

Anticipated number of participants: 20 participants

Approximate ages: 3-10

Submission date: XX/XX/XXXX

Anticipated start date: XX/XX/XXXX

 Expedited Review: for research that does **not** manipulate participants' behavior, use deception, threaten privacy, or cause stress to participants (e.g. observational studies, studies of archival data, some questionnaire and interview studies). Review takes approximately 5 days.

 X **Full Review:** for all research that is not eligible for expedited review. Reviews occur once each semester.

Purpose of Investigation and Procedures

The human visual system is a complex network of neurons in the brain that uses information from the eyes to form internal representations of the world. One of the difficulties in this task is that the eye sends only small pieces of segmented information; the brain must therefore construct a representation of the world by linking or "integrating" segmented information from the eyes together into lines, curves, edges, and patterns. This process has been referred to as contour integration (Field, Hayes, & Hess, 1993) and is fundamental to visual perception. It is believed that the neurons in the brain are connected to one another in a specific pattern to perform this task. Specifically, if the small pieces that make up a contour are oriented in the same direction as the curve, they are more likely to be detected than if those pieces are randomly aligned or jagged. The connection rule, termed the "association field" by Field et al. (1993), which governs performance for detecting smooth contours resembles a bow tie shape and has been hypothesized to form over the course of early visual development. Recently, we have designed an artificial neural network which will enable us to test a number of aspects of the association field model. The images that will be sent to the neural network are chosen based on the parts of images normal adults look at (i.e., fixate). In order to test developmental aspects of the association field, we will also need to send the network image patches that have been fixated by small children. Accordingly, we will need to measure where young participants (aged 4-6 years) look when viewing different pictures of real-world content.

The current study will involve asking young children to simply look at a series of digital images presented on a CRT display monitor. The images consist of pictures taken from different forests across the mid-west and will contain no objectionable material. In order to help hold the participants' attention on the task, images of cartoons (Nickelodeon: Dora, Diego, etc. or Disney: Pooh, Toy Story, etc.) will be presented every minute. Participants will be asked to view these images while having their eye movements monitored with an eye tracker (EyeLink 1000) to determine what parts of the image (s)he looks at. In order to allow for accurate eye-tracking, participants will be asked to wear a small target sticker on their foreheads. An eye tracker is a machine that uses infrared light (i.e., heat) to illuminate the participant's face and uses an infrared camera to record eye movements. The infrared light that will be used to illuminate the faces of the participants is far less than what would be experienced on any typical day spent outdoors. The total duration of the study should take no longer than 1 hour. At the end of the study, each child will be given a small booklet of stickers for their participation.

Anticipated Risk and Potential Benefits to Participants

There are no potential benefits for the participants. While the proposed general paradigm is extremely low-risk, it is not completely free of risk. The primary risk is related to simple ergonomics. Participants will be required to remain seated in front of a CRT display, which may lead to a low level of

discomfort. Additionally, having to fixate on a CRT monitor display for an extended duration could potentially lead to minimal eye-strain and maybe a slight headache. If the participants should request a break, the experiment will be broken up into blocks to accommodate them. Because this experiment requires the use of an eye-tracker, special care will be taken to ensure the wellbeing of the participants (e.g., multiple short breaks), including parental support. The use of an eye-tracker has no documented risks to the physical or psychological well-being of human participants. The steps proposed to minimize the already low-risk potential of the proposed paradigm leave little if any possible risk which is far outweighed by the impact of this research.

Steps Taken to Protect the Participants

Given the steps proposed in the previous section to protect the physical well-being of the participants, additional steps will be taken to protect their psychological wellbeing. Since the visual stimuli will not contain any offensive material (e.g., images of an offensive nature), there is no concern of any psychological harm along those lines. Participant confidentiality will be maintained by assigning each participant a pseudo-random code (i.e., a “participant code”) which will consist of a six-character string of letters and numbers. Information about the participants’ age and gender will be gathered, but will be encrypted into the participant code described above. The participant code will be assigned to each of the data files that each participant generates via participation. All data files will be stored in electronic format on one of the lab computers and will be backed-up periodically and stored in a secure location. Only the principal investigator of this study and his faculty supervisor will have access to the data.

Manner of Obtaining Participants

Participants will be recruited from the local community through preschools and experimenter connections in Hamilton (e.g. a relationship with a religious community with an active children’s program). Parents of all potential participants will receive a full description of the experiment (including a copy of the consent form) prior to an invitation for their child’s participation. Parents will be asked to sign the Certificate of Informed Consent after they have arrived at the designated experiment site and have had a chance to look over the experimental set-up. If the parents agree to allow their child to participate and have signed the Certificate of Informed Consent, their child will then be asked if (s)he would like to participate (via the assent form). Participants will receive a number of stickers as compensation for their participation. School permission will be granted and the appropriate form (pulled from the Colgate IRB website at the bottom of this page: <https://www.colgate.edu/about/campus-services-and-resources/irb-proposal-creation-guidelines>) will be submitted.

References

Field, D. J., Hayes, A., & Hess, R. F. (1993). Contour integration by the human visual system: evidence for a local "association field". *Vision Research*, 33(2), 173-193.

Parent Certificate of Informed Consent

Overview and Procedure: The current study is concerned with assessing how the human brain controls eye movements at various stages of visual development when looking at different pictures of the natural environment. The task your child will be asked to complete is simply to look at a series of digital images presented on a CRT display monitor (i.e., a computer monitor). The images your child will be viewing consist of pictures taken from different forests across the mid-west and contain no objectionable material. In order to help keep your child's attention on the task, images of cartoons (Nickelodeon: Dora, Diego, etc. or Disney: Pooh, Toy Story, etc.) will be presented every minute. As a participant, your child will be asked to view these images while having their eye movements monitored with an eye tracker (EyeLink 1000) to determine what parts of the image (s)he is looking at. Your child will also be asked to wear a small sticker on her/his forehead. The eye tracker is a machine that uses infrared light (i.e., heat) to illuminate the participant's face and uses an infrared camera to record eye movements. The infrared light that will be used to illuminate your child's face is far less than what would be experienced on any typical day spent outdoors. The total duration of the study should take no longer than 1 hour. You are invited to be present and support your child in any way throughout the duration of the study.

Risks and Benefits: There are no direct benefits to your child as a participant if you should decide to allow her/him to participate in the current study. While the current study is low-risk, it is not without some very minor risks. The primary risk is related to simple ergonomics. Your child will be asked to remain seated in a chair with his/her head resting on a padded chinrest in front of a computer monitor, which may lead to a very low level of discomfort. Additionally, having to fixate on a computer monitor for an extended duration could lead to minimal eye-strain and maybe a slight headache. However, the above-mentioned risks would be no more than your child would experience while playing video games or watching a movie on the computer for an hour. In order to alleviate these very minor risks, your child will be allowed to take short breaks during the actual study if necessary. Since this study involves the use of an eye-tracker, the same steps described above will also be employed. The use of an eye-tracker in developmental vision research is quite common and has been in place over the last 50 years and has resulted in no documented risks to the physical or psychological well-being of participants (young or old). If you are not willing to accept the risks as stated above, inform the experimenter now.

Confidentiality: Your privacy and the privacy of your child will be protected. At no time will identifying information about you or your child be disclosed. Any information obtained during the course of your participation will remain confidential and will be used solely for research purposes. Identifying information will not be recorded with the data that documents your child's eye movements during the task and all data will be stored on password-protected computers.

Compensation: Your child's participation in the current experiment is purely voluntary. If you, the parent, have no objection, we will have a variety of stickers for your child upon completion of the study.

Your Rights: As with any research project, your child's participation is voluntarily. Your child may withdraw from the study at any time, or decline to participate (or you may ask that your child be withdrawn at any time) with no penalty.

Contact Information: If you have questions or concerns about your rights or your child's rights as a participant, please contact the principal investigator of this project, XXX, their faculty supervisor, XXX, or the Chair of the IRB committee at Colgate University, IRB_chair@colgate.edu.

By signing below, you are agreeing 1) to allow your child to participate in this study, 2) that you have read and understand all of the information provided on this form, and 3) that you are 18 years old or older.

Participant Name (please print)

Researcher Name (please print)

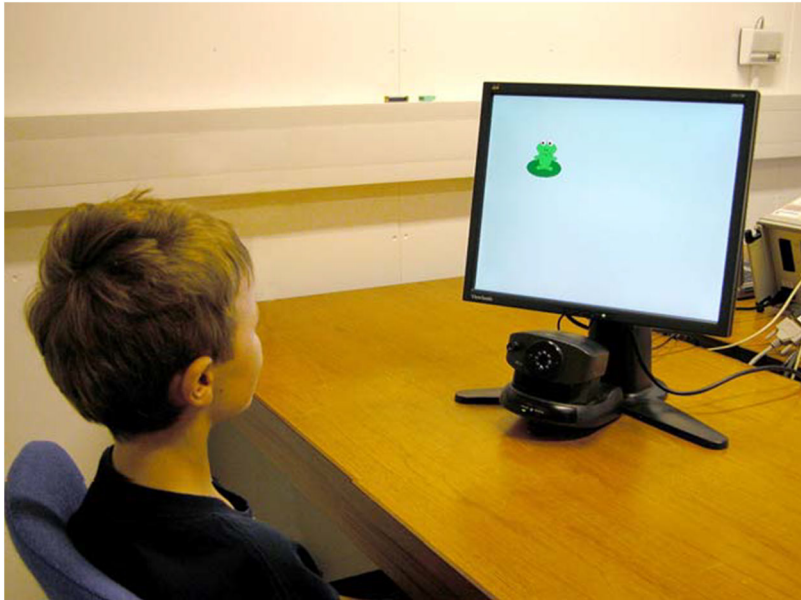
Participant Signature

Researcher Signature

Date

Date

Child Certificate of Informed Assent



The following document will be read out loud to the child by the experimenter: Do you see the camera underneath the computer screen in this picture? That camera is looking at the boy's eyes to find out where he is looking on the screen, so it knows that he is looking at the green frog right now. We have a camera like this here at the college called "Minty". We want to show you some pictures of the outside, things like forests and lakes, and find out what you like to look at. I can tell you how it works if you like. You will have some time to look at each picture, so take your time. And every once in a while there will also be some pictures of characters from

television, so keep your eyes open.

Now do you see the headrest the girl is using? The camera looking at her eyes doesn't move very easily, so the headrest is there so she doesn't get too far away from it. Our camera is the same way, so when we get to the room you'll find a headrest there too. You'll need to keep your chin on the rest just like the girl in the picture, but if you get tired we can stop for a while before we continue.

Your mom/dad can stay with you for the whole time, and the whole thing probably won't take longer than an hour. So do you think you understand what we're going to be doing today?

Okay then, do you want to start now?



APPROVAL TO CONDUCT RESEARCH IN SCHOOLS

To the Principal:

The research study described here has been reviewed by Colgate University’s Institutional Review Board. This researcher is now seeking schools willing to cooperate in the study. Please sign below if you agree to have your school participate in this study.

In order to begin the study, the researcher must submit this form and submit it as a Modification (via an email to the IRB Chair)– signed by the principal of each school that will be participating in the study.

Researcher/Primary Investigator:

Title of Study:

IRB Protocol Number: _____

Research Will Involve:

Cooperating School	Start Date of Data Collection	School’s Responsibilities

School Signature

Date