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The Temporal Dynamics of Learning Center's
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this issue

Eyes, Mouth, or Nose?

Quick, visualize the face of your favorite movie star!

Ok, what features come most readily to mind -- eyes, mouth, or maybe even the nose? Vision scientists have long believed that the eyes play a bigger role in facial recognition than any other features.

But now it seems this may not be true for everyone, as a recent study by TDLC researchers Jim Tanaka and Robert Shultz has

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Developing Face-like Expertise with Novel Objects

For decades, scientists have debated whether faces are "special" because we have evolved a brain system dedicated to face recognition or become special through extensive practice recognizing faces. One way that faces are not recognized like most other objects is that we treat them more "holistically". For example, we find it almost impossible to attend to only one part of a face and ignore the rest. Look at the face in the figure. Ignore the mouth.

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TDLC Announces New 'Educators Networks'

Plans for development of The Educators Networks are in progress, according to the networks' director, Doris Alvarez. The Purpose of The Educators Networks will be to work with TDLC scientists to translate findings from neuroscience research into the classroom. Alvarez indicates that there will be two levels of the Network: The Teacher Educator Network and the Educator Executive Network. The Teacher Educator Network will be made up of exemplary classroom teachers who will advise and provide information to TDLC scientists on areas that are ripe for research in the classroom. In the beginning, plans are to focus on mathematics instruction in light of the difficulty many students have when they commence the study of algebra. Two mathematics teachers have been recruited thus far, Dr. David Weber from The Preuss School and Joan Hanley from Mt. Carmel High School. In the ensuing months at least three more math educators will be invited to join the network.

Alvarez indicates she also hopes to recruit another group of educators to be called The Educators Executive Network who are well known in the field of education and would provide advice and vision on a macro level. These educators will be change agents - superintendents, entrepreneurs in education, and reform minded educational leaders, for example. Alvarez would welcome any suggestions for names of individuals to make up this group.

For further information about these groups, please contact Doris Alvarez at dalvarez1@cox.net.

Fast ForWord: Not Just a Slogan

By Carolan Gladden

Some thirty years ago, TDLC's Paula Tallal, along with other noted research scientists Michael Merzenich, William M. Jenkins and Steven Miller, established several key findings and began a collaboration that led in 1997 to creation of Fast ForWord. Among other things, they observed that cognitive and linguistic abilities could be improved through intensive intervention and that computers could be used to create interactive learning interventions. These observations and subsequent research resulted in formation of Scientific Learning Corporation and development of an

Trainee Committee Awards

In response to a call for proposals announced in October, 2008, the TDLC training committee awarded $7,000 in small grants to support trainee research and collaboration. Below is a list of awardees and funded projects:

Olivia Cheung
PI: Isabel Gauthier
Institution: Vanderbilt University
Project: Overlap in processing mechanisms between faces and objects of expertise

Jean M. Vettel
PI: Mike Tarr (collaboration with Tim Curran @ Colorado)
Institution: Brown University
Project: Cross-network collaboration to study the temporal and semantic factors of multimodal integration

Brock Kirwan
PI: Larry Squire
Institution: UCSD
Project: The neural mechanisms of familiarity- and recollection-based memory

Christopher Kanan
PI: Garrison Cottrell
Institution: UCSD
Project: Developing a robotic active vision platform

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Dr. Paula Tallal co-founded Scientific Learning Corp., and its reading intervention program, Fast ForWord

We asked Paula about the program's early roots and future goals

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entire family of reading intervention programs that help students achieve reading success across the country and beyond.

TDLC Director Gary Cottrell provides background: Recent neuroscience research demonstrates that the intrinsic temporal dynamics of processes within the brain may either reinforce or constrain learning. For example, we have discovered that slow learners tend to have slow "shutter speeds" in terms of how their brains take in and process information. For some poor readers the underlying problem is their inability to perceive fast acoustic changes in speech sounds (phonemes) that must be accurately perceived in order to learn letter-sound corresponding rules for reading. Fast ForWord, as a neuroscience-based training regimen that improves this temporal processing ability, is a great aid for struggling readers in learning both spoken and written language.

Dr. Tallal remains a Director of Scientific Learning Corporation, is a TDLC Executive Committee member and Co-Director of TDLC Education and Outreach, as well as Board of Governors Chair of Neuroscience and Co-Director of the Center for Molecular and Behavioral Neuroscience at Rutgers University. A world-recognized authority on

> "Fit Brains Learn Better."

language-learning disabilities, she says, "I got interested in literacy by way of my long-term interest in language and the brain. My first experience was working with adult patients who had lost their language as a result of brain damage. I was absolutely horrified that you could lose the ability to communicate, to express yourself, or even understand what other people said." Later in graduate school Dr. Tallal became interested in children with difficulty developing the ability to talk although otherwise developing normally and discovered through research a high incidence of these children also developing difficulty in reading, writing and spelling. At that point, she explains, she became interested in the entire continuum between oral and written language, "… what we could learn by studying children who are struggling. My particular interest was how the brain does it."

Then, under the maxim "Fit Brains Learn Better," Scientific Learning Co-Founder and Senior VP of Product Development William Jenkins brought in his expertise in learning-based brain plasticity, behavioral algorithms and internet technology. And so began development of a range of programs that build foundational reading and language skills by developing brain processing efficiency. They accomplish this through intensive, adaptive exercises that correlate both the sound and the sight of letters and words and on to sentences and paragraphs. Fast ForWord supports existing classroom curricula in developing and strengthening memory, attention,

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Developing face-like expertise

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Are these the eyes of Matt Damon? (the answer is yes). Ignoring misleading parts of an image is much easier with common non-face objects. However, prior research had suggested that once people become expert with novel objects, those objects are also processed holistically. But up to now it was unclear what it was about expertise that produced this holistic effect. In a study headed by Alan Wong (now at Chinese University of Hong Kong), conducted at Vanderbilt University with Isabel Gauthier and Tom Palmeri from the NSF funded Temporal Dynamics Learning Center, this question was investigated by comparing two different types of training regimens with the same novel objects ("Ziggerins" in the figure). One group learned to individuate these objects with unique names, much like we do with faces. Another group learned to categorize the objects into groups that share a structure (along the rows of the figure, below) but learned to do this very fast. Each group became better than the other group at the task it was trained on, illustrating that different kinds of perceptual expertise with the same objects can develop. Critically, only the group that learned to individuate Ziggerins later processed novel Ziggerins holistically, like faces. This research adds to the evidence that faces are special because of our expertise with them. It also tells us what it is about our experience with faces that leads us to treat them holistically. This knowledge may be useful in the development of training protocols for individuals with difficulties in face perception, such as individuals with Autism Spectrum disorders.

Let's Face It!

discovered that children with autism spectrum disorder (ASD) perceive faces based on both eye and mouth features.

During testing children were shown two faces identical except for eyes or mouth. Typically developing children exhibited the usual eye bias and were more accurate in spotting differences in the eye area. Strikingly, children with ASD performed just as well in their ability to detect differences in the mouth area but not as well in the eye area.

Searching for a reason for this apparent impairment in face processing, it seems plausible that if eyes seem socially threatening to individuals with ASD, they would look more at the lower, mouth region of the face.

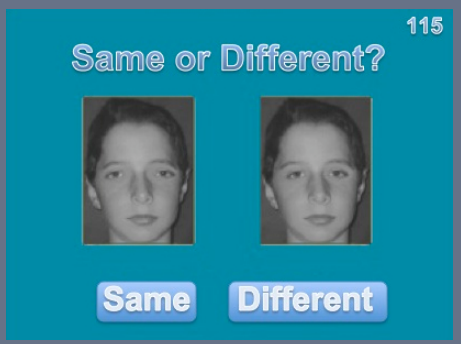

Figure: Specific impairment of face processing abilities in children with autism spectrum disorder using the Let's Face It! Skills Battery.

It is hoped that the group's findings may provide valuable clues for developing effective interventions to enhance the face processing skills of these children, such as TDLC's NSF-funded Let's Face It! program.

Trainee Awards

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David Peterson
PI: Howard Poizner
Institution: UCSD
Project: Sensorimotor sequence learning in healthy and neurologically-impaired humans

Jason J. Jones
PI: Harold E. Pashler
Institution: UCSD
Project: Computational modeling of the temporal dynamics of learning and attention

Doug Yovanovich
PI: Virginia de Sa
Institution: UCSD
Project: Testing the modality specificity of timing

Brains 'R' Us II

The popular Brains 'R' Us event has been rescheduled in order for organizers to develop a new, more interactive format for the event. We plan to establish BRU2 as a Fall event so that it will coincide with the beginning of the academic year. This will provide teachers and educators a better opportunity to immediately develop and apply in the classroom the brain-based learning concepts they take home from the event and those they acquire from the ongoing interactive experience.

Brain Trivia

Which part of the brain is essential for the encoding of new declarative memories?

a) Cerebellum
b) Pons
c) Broca's Area
d) Hippocampus

Look for the answer in the next newsletter, or log on to tdlc.ucsd.edu

Answer to last Issue's Trivia Question: B, medial

Fast ForWord

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and processing rate and sequencing—the cognitive skills essential for learning and reading success.

Individual success stories abound, such as a 10th grader who read at 1st grade level, assigned to remedial and special ed classes to no avail, until 3 weeks of training for 60 minutes a day with a personal coach and Fast ForWord software propelled him into the realm of "Reader" with a capital R. Today at 20, in college and on the road to becoming a teacher, he says, "I love reading now. Used to be, if you put a book in my hand, I'd say, 'Take it back.'"

Now, a new TDLC research project is using archival Fast ForWord data, such as time series analysis and machine learning, to identify possible relationships between the timing of training sessions and changes in learning performance. The team, led by TDLC's Eduardo Mercado, Assistant Professor and Director, Neural and Cognitive Plasticity Lab at University at Buffalo, SUNY, hopes that the project will contribute to the development of sophisticated techniques for adaptively controlling the timing and structure of training to meet the real-time needs and capabilities of individual learners.

Efforts to spread Fast ForWord information to teachers, parents and students in need include SLC's Brain Fitness Seminars, Summits and Webinars.

For more information, you can visit www.scilearn.com

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Where Have they Gone

Former TDLC Trainees Tackling New Opportunities

- **Heather Flowe**, Post-Doc/UCSD is now a Lecturer at University of Leicester, U.K.
- **Alex Foss**, BA/Yale, is now a Research Assistant at Children's Hospital of Philadelphia.
- **Janet Hsiao**, Post-Doc/UCSD is now Assistant Professor, University of Hong Kong.
- **Shantanu Jadhav,** PhD/Berkeley, is now a postdoctoral researcher in Loren Frank's lab at UCSF.
- **Jonathan Nelson**, Post-Doc/UCSD is now a Research Scientist at Max Planck Institute, Germany.
- **Christine Shin**, BA/Yale, is now a Research Assistant at Children's Hospital of Philadelphia.
- **Alan Wong**, PhD/Vanderbilt, is now an Assistant Professor, Chinese University of Hong Kong.
- **Lingyun Zhang**, PhD/UCSD, is now a Scientist at ID Analytics, Inc. in San Diego.

Upcoming Events

TDLC All Hands Meeting
February 20th & 21st
San Diego, CA

NSF Site Visit
June 10th &11th
San Diego, CA

TDLC Trainee Bootcamp
August 10th – 22nd
San Diego, CA

Brains 'R' Us II
Fall 2009 (Date: TBD)
San Diego, CA

Our Mission

The Temporal Dynamics of Learning Center (TDLC) will develop a science of the temporal dynamics of learning that treats time as a crucial element in the learning process. We will integrate the study of learning dynamics across multiple time scales - from milliseconds, to life-long learning. This new science will inform educational practices and result in better learning outcomes.

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