

# North American Brain Injury Society's Seventh Annual Conference on Brain Injury

October 14–17, 2009  
Austin, Texas

## Abstracts



Dear Colleagues,

The North American Brain Injury Society (NABIS) is pleased to present the accepted abstracts from the Seventh Annual Conference on Brain Injury in this special issue of the *Journal of Head Trauma Rehabilitation*.

We were delighted to have received close to a 20% increase in submissions this year. While we were unable to accept every submission, we believe the research presented in the pages that follow clearly demonstrates the quality of the work now being conducted across the continuum of care in the field of brain injury.

NABIS is looking forward to a wonderful event in Austin this fall. The NABIS scientific planning committee put together an exceptional program featuring an outstanding faculty of internationally recognized speakers, as well as several new features including an evening “meet the experts” session and special panels covering Mild Brain Injury, State/National Trends and Issues Impacting Brain Injury Care, and Emotional Perception. Also new this year, with the support of Lash and Associates Publishing/Training and the Sarah Jane Brain Project, NABIS is pleased to present a special preconference symposium on Wednesday, October 14. This symposium will outline a plan for a comprehensive, integrative, accessible, culturally sensitive, long-term, and child/family-centered circle of care for children, adolescents, and young adults with acquired brain injury. The plan was created by the Sarah Jane Brain Foundation with a panel of national experts including families and family advocacy organizations, attorneys, physicians, allied healthcare professionals, educators, and researchers. NABIS has also organized several preconference workshops with topics including Sexuality and TBI, the Mayo Portland Outcome instrument, and a “Legal 101” session for medical professionals. The full program can be found at the NABIS Web site: [www.nabis.org](http://www.nabis.org).

We hope that you will consider submitting your work for our 2010 meeting. Better yet, we hope that you will also consider becoming a member of our multidisciplinary society. Whether it is in the area of research or clinical care, NABIS stands behind the premise that advances in science and practices based on application of the scientific evidence will ultimately provide the best outcomes for those with brain injuries and the community as a whole.

Sincerely,

Robert D. Voogt, PhD  
Chairman, North American Brain Injury Society

Ronald C. Savage, EdD  
President, North American Brain Injury Society

Harvey E. Jacobs, PhD  
NABIS Conference Chair

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The North American Brain Injury society (NABIS) is entirely responsible for the scientific content of these abstracts. These abstracts have undergone peer review by NABIS to determine suitability for their national conference. No additional peer review of these abstracts was performed by the editors or the editorial board of the *Journal of Head Trauma Rehabilitation*.

NABIS is proud to announce that Dr Nicole Andreatta and Dr Kathleen M. Youse have been selected as the 2009 recipients of the Charles W. Haynes Fellowship. Their abstracts are presented below.

### **Narrative Interviews With Family Members of a Traumatic Brain Injury Survivor: A Qualitative Inquiry**

Nicole Andreatta, PsyD

*Alliant International University*

#### **Objectives**

The purpose of this study was to learn more about the lived experiences and needs of family members of individuals with a traumatic brain injury (TBI) 3 to 5 years postinjury. The research also investigated the potential of narrative practices to help families envision preferred futures, shift their relationship to long-standing problems, and build communities of support for the enactment of new lives after head injury.

#### **Methods**

Qualitative interviews informed by narrative practices were used to explore questions regarding the experiences and perceptions of the immediate family members of a TBI survivor. Narrative interviewing techniques (Freedman & Combs, 1996) were utilized to produce a more robust understanding of family reactions to brain injury over time and available resources needed both within and outside the family unit (Camplair et al., 1990) as well as to establish praxis (Ewing, 2007).

#### **Results**

Results highlighted how participants tended to see head injury as a personal and private issue, as opposed to a social issue. They felt that society treats persons with disabilities as not normal, and it does not welcome difference. This social view in turn resulted in participants feeling angry, isolated, and marginalized. The power imbalances within each family were further supported by power imbalances in the larger culture. Study findings further suggest that knowledge of these social influences and struggles may be helpful to rehabilitation professionals in addressing the specific needs of families of TBI survivors.

### **Conversational Discourse Following Closed Head Injury: A Preliminary Investigation Into Attention Training and Conversation Analysis Procedures**

Kathleen M. Youse, PhD, CCC-SLP, BC-ANCDs (A)

*Division of Communication Sciences and Disorders, University of Kentucky*

#### **Objectives**

Individuals with closed head injury (CHI) may show a pattern of deficits involving attention, memory, and executive functioning that can impair conversational communication. This can negatively influence community reintegration and promote social isolation. This study investigated whether treatment of attention deficits could improve functional conversational skills. It was hypothesized that modifying a previously used Response Appropriateness paradigm would improve in-

formation about conversational ability, assist in revealing effects generalized from cognitive treatment, and improve specificity of therapeutic communication goals.

#### **Method**

Standardized cognitive-linguistic and attention assessments were completed and conversational samples were collected before, during, and after treatment of 2 individuals with CHI. Treatment was provided utilizing a direct attention training program. Conversations were analyzed using the original Response Appropriateness paradigm and a Modified Response Appropriateness paradigm specifically designed for this study.

#### **Results**

One subject made substantial progress while the other did not. Results from the original Response Appropriateness paradigm suggested that it was not representational of communication abilities of individuals with CHI. The Modified Response Appropriateness paradigm provided more information. It accounted for single-word responses, unintelligible responses that rendered awkward responses, and pauses that do not contribute to the conversation. This information may provide speech-language pathologists with a hierarchy to guide treatment decisions for individuals with CHI as they progress through rehabilitation.

### **0001**

#### **Primary Healthcare Access for Persons With Traumatic Brain Injury**

Gerard Francisco<sup>1</sup>, Meilani Mapa<sup>1</sup>, Jack Fu<sup>1</sup>, Margaret Struchen<sup>2</sup>

<sup>1</sup>University of Texas Health Science Center, Houston, <sup>2</sup>Baylor College of Medicine, Houston

#### **Objectives**

To assess the perceived access to, and quality of, primary care of persons with TBI by survivors and their caregivers.

#### **Method**

Survey and interview of 339 consecutive admissions to a free-standing brain injury rehabilitation program. Participants were at least 18 years of age, had a primary diagnosis of TBI, had been discharged from acute inpatient rehabilitation at least 1 year prior to the survey, and were currently under the care of a primary care physician (PCP). The questionnaire focused on 5 areas: perception of the PCP's knowledge of and attitude toward TBI; perception of the PCP's office staff's knowledge of and attitude toward TBI; patient/caregiver compliance; transportation/office accessibility; and other select social issues.

#### **Results**

Participants answered "Never/Rarely" more than 50% of the time when asked whether they thought their PCP addressed the following problem areas: memory, speech & communication, emotion & behavior, spasticity, motor strength, mobility, activities of daily living, goals for functional independence, therapies, and durable medical equipment. In addition, participants identified the following areas for improvement of PCP's staff: taking into consideration a TBI person's thinking problems

when giving instructions (talking slower, writing down instructions, or communicating with family members); understanding physical disabilities; need for assistance or accommodations; and providing physical help when needed.

## 0002

### Co-occurrence of Traumatic Brain Injury and Chemical Dependency: Screening for TBI Among Women in Outpatient CD Programs

Ruthie Dallas<sup>2</sup>, Amber Maki<sup>1</sup>, Gregory Murrey<sup>3</sup>

<sup>1</sup>Minnesota Neurorehabilitation Hospital, Brainerd, <sup>2</sup>Chemical Dependency Division—Minnesota Department of Human Services, St Paul, <sup>3</sup>Fielding Graduate University and Minnesota Neurorehabilitation Hospital, Brainerd

#### Objectives

To assess the prevalence of TBI history, corresponding TBI sequelae, and etiology of TBI in women participating in outpatient chemical dependency programs.

#### Method

*Participants:* A total of 2198 women from a variety of racial and ethnic backgrounds participated in various chemical dependency treatment programs throughout the state of Minnesota. *Measure/Method:* During intake to the outpatient treatment program, the interviewing CD counselors/case manager completed a TBI screening questionnaire with the client. The questionnaire included specific questions regarding head trauma history, resulting period of LOC, chronic sequelae, and cause of the injury.

#### Results

A total of 930 (42.3%) subjects reported history of at least 1 brain injury and 898 (40.8%) reported that the injury was caused by another person—60.5% of these reportedly being caused by a current or past intimate partner. Further data on reported postinjury residual and chronic sequelae and breakdown by ethnic/racial groups are presented. Prevalence of TBI history in women with CD issues from different ethnic and racial groups as well as high rates of TBI resulting from domestic abuse is discussed. Further discussion on implications for screening in clinical settings is provided.

## 0005

### Supports for Community Living for Individuals With Traumatic Brain Injury

George Griffith

Cortland Community Re-entry Program, Cortland, New York

#### Objectives

National statistics indicate that many individuals with TBI fall into a special needs category because of maladaptive behaviors, substance abuse issues, and significant physical disabilities, making it difficult for them to gain access to clinical and housing options outside institutional care. Given the special needs of consumers with TBI, the objective of this presentation is to describe how one community reentry program promotes consumer independence and empowerment.

#### Method

An approach serving the needs of the TBI consumer is described that utilizes the home environment as a basis for clinically functional interventions. It is based on the use of interdisciplinary services and strategies in a caring, home-like atmosphere.

#### Results

Participants will gain insight into what these strategies are and how they are implemented in a functional setting. The presentation will also review administrative functions and staffing issues, including strategies utilized to ensure quality staffing.

## 0006

### Bridging the Gap: Development of a Culturally Diverse Workshop for Young Adults

Mariann Young, Heidi Reyst, Paul Van Dyke, Suzette Finney

Rainbow Rehabilitation, Farmington, Michigan

#### Objectives

Young adults with traumatic brain injury (TBI) experience differences in transition to adulthood compared with their noninjured peers. With this in mind, a day treatment program with vocational, therapeutic, and recreational components was developed. It was noted that attendees of the program who practiced vocational, work, and social skills together in a monitored environment were also culturally diverse. Issues of diversity and race were discussed openly so that problem solving could occur. The objective of this study was to assess attitudes regarding race and ethnicity.

#### Method

*Participants:* Fifteen members of a young adult program including females ( $n = 2$ ) and males ( $n = 13$ ), younger than 20 years ( $n = 6$ ), 20–25 years old ( $n = 8$ ), and 26–30 years old ( $n = 1$ ) were asked to complete a survey that assessed attitudes regarding race and ethnicity. Caucasians ( $n = 6$ ) and African Americans ( $n = 9$ ) were surveyed. One male identified his ethnicity as Hispanic, and one male identified his ethnicity as Arabic.

#### Materials

An 18-item, 7-point Likert scale was developed and administered to the participants.

#### Setting

Each participant completed the survey in the workshop.

#### Results

Frequencies were run by item. Means were calculated for each item to assess levels of agreement or disagreement. A principal-components factor analysis with varimax rotation was performed. The final result was a forced 4-factor solution with the following scales: Comfort with Other Races; Program Diversity; Cultural Harmony; and Cultural Disharmony. Means by race for each scale were examined. Independent sample  $t$  tests were run. Cultural Disharmony achieved significance ( $t = 3.846$ ,  $df = 2$ ,  $P = .002$ ). ANOVA was run. For Cultural Harmony, both Age ( $F = 7.917$ ,  $df = 2$ ,

$P = .006$ ) and Education ( $F = 3.792$ ,  $df = 3$ ,  $P = .043$ ) reached significance. For Cultural Disharmony, race reached significance ( $F = 14.789$ ,  $df = 1$ ,  $P = .002$ ).

## 0007

### Traumatic Brain Injury and Irlen Syndrome

Sandra Tosta<sup>1</sup>, Patricia Johnson<sup>2</sup>

<sup>1</sup>The Irlen Institute, Long Beach, California, <sup>2</sup>PJ Johnson, PhD & Associates PC, Baytown, Texas

#### Objectives

Acquaint TBI professionals with the symptoms of Irlen syndrome that can occur following a TBI and result in a significant sensitivity to light, glare, contrast, bright colors, patterns, and difficulties with demands for continuous performance. These symptoms can be helped by treatment with color. A short video of a patient with TBI before and after treatment of Irlen syndrome will be presented. In addition, a study of 45 patients with TBI that helps determine the percentage of TBI patients apt to suffer symptoms of Irlen syndrome following a TBI will be presented.

#### Method

1. An 8-year post-head injury patient who suffered frequent seizures and decreased cognitive processing speed was treated for Irlen syndrome. The presenting DVD demonstrated how she is treated for her significant light sensitivity with Irlen colored filters and changes in her performance were noted and recorded.
2. A survey was conducted with 45 individuals with TBI about possible symptoms of Irlen syndrome. Those with symptoms kept journals of changes in processing, language, and motor abilities following treatment with colored filters.

#### Results

The DVD demonstrates performance before and after treatment with Irlen colored filters of an individual 8 years after TBI. Results demonstrate increased speech and language skills, increased speed of processing, and a decrease in seizure activity following treatment. In addition, a survey of 45 TBI patients identified 53% who demonstrated symptoms of Irlen syndrome. Their journals indicated immediate improvement in many areas typically associated with TBI as a result of treatment including speech, motor coordination, body tremors, headaches, seizure activity, word retrieval, communication ability, and significant reduction in anxiety and irritability. These improvements occurred in a relatively short period of time.

## 0008

### Can Exercise Improve Function After TBI?

Brian Greenwald

Mount Sinai Medical Center, New York

#### Objectives

Participants will be able to

1. demonstrate a basic knowledge of previous literature on exercise in the disabled population,
2. discuss the benefits of exercise on fatigue after brain injury, and
3. discuss the benefits of exercise on depression after brain injury.

#### Method

Reduced cognitive functioning, depression, and fatigue, common sequelae of TBI, are barriers to the rehabilitation and community integration of persons with TBI. Although research examining the effects of aerobic exercise in individuals with TBI is limited, exercise has been found to be effective in improving cognition, depression, and/or fatigue in individuals with other medical conditions, such as cancer, multiple sclerosis, fibromyalgia, dementia, chronic fatigue syndrome, and chronic obstructive pulmonary disease as well as in the elderly.

#### Results

Data will (a) examine the efficacy of an aerobic exercise intervention for improving cognition, depression, and fatigue after TBI, (b) evaluate the effect of post-TBI exercise on life satisfaction, and (c) discuss current research that presenter is doing to evaluate and quantify the efficacy of exercise as a treatment after TBI.

## 0009

### A Study on ERP of Face Implicit Recognition

Wu Wen, Luo YueJia

Rehabilitation Department, Zhu Jiang Hospital, Guang Zhou City, China

#### Objectives

To identify whether face recognition is implicit, and its specificity, other race effect and inversion effect implicitly.

#### Method

Visual stimuli consisting of upright and inverted human faces, eastern and western, upright dog faces, and mobile faces were presented promptly (150 ms) and attention was then diverted away to search the target "f" in serial letters below the stimuli. Behavioral and ERP studies were subsequently performed.

#### Results

The P100, N170, and P170 of faces were enlarged and forwarded compared with those of nonfaces. ERP components were not affected by the orientations and races of faces in this situation. Furthermore, it is found that LPC of implicit processed human faces and other faces were not different.

#### Conclusions

Implicit face recognition is still special, although other race effect and face inversion effect disappear during this procedure.

## 0010

### Medicolegal Issues in Post-Head Injury Sequelae in the Absence of a Standardized Assessment System

Gita Handa

AIIMS, New Delhi, India

## Objectives

To highlight issues relating to disability assessment in dynamic situations and subsequent medicolegal implications in India where there are no standardized guidelines for assessment of brain injury sequelae and evaluation is not objective. As a result, situations regarding disability may be exploited by either side in a legal case and affect subsequent rehabilitation outcomes.

## Method

A qualitative case study approach was used to understand the various issues involved during assessment and litigation and the final outcomes in the rehabilitation of a brain-injured patient.

## Results

Temporal analyses of events highlighted the vulnerability of the decision-making bodies due to the lack of objectivity in assessment tools. The present state of confusion may benefit some but may harm the scientific perspective on outcomes evaluation and disability assessment. Therefore, keeping in mind the Indian sociocultural setup, it is imperative that disability assessment scales are formulated and laws relating to disability evaluation in brain injury sequelae are modified.

## 0011

### Internet-Based Sports Concussion Training for Youth Sports Coaches

Ann Glang<sup>1</sup>, Michael Koester<sup>2</sup>

<sup>1</sup>Oregon Center for Applied Science, Inc, Eugene, <sup>2</sup>Slocum Center for Orthopedics and Sports Medicine, Eugene, Oregon

## Objectives

Youth sports coaches and athletics staff are in an important position to identify behavioral and physical symptoms and to mitigate the risks associated with concussion in young athletes. However, few receive training on this topic. This presentation will report findings from a recent study that evaluated ACTIVE: Athletic Concussion Training, an interactive Web-based program designed to train community coaches of youth aged 10 to 18 years on effective sports concussion prevention and management practices.

## Method

The study was conducted over the Internet with a sample of 75 youth sports coaches from across the country. Participants were randomly assigned to either the ACTIVE program or a control condition, and completed pre- and posttraining measures in one session. Knowledge and attitudes were measured using the Survey of Concussion Understanding and Management (Guilmette et al., 2007) and the Survey of Sport-Related Concussion Misunderstandings Among Youth Coaches (McLeod et al., 2007). Additional measures included program-specific knowledge questions and scenario-based questions designed to assess how well coaches might apply concussion management strategies on the field.

## Results

Results indicated that the coaches who viewed the ACTIVE program showed significantly greater improvement than those in the control group in their knowledge of concussion symptoms, their confidence regarding recommended actions following concussion, and their intention to take action in situations like those presented in sample scenarios.

## 0012

### Incidence of Insulin-Like Growth Factor-1 and Growth Hormone Deficiencies in a Postacute, Brain Injury Rehabilitation Setting

Lisa Kreber, Mark Ashley

Centre for NeuroSkills (CNS), Bakersfield, California

## Objectives

Posttraumatic hypopituitarism is an often-undetected consequence of traumatic brain injury (TBI). Studies have estimated the incidence of pituitary dysfunction in patients with TBI to be as high as 50%. Symptoms of posttraumatic hypopituitarism include fatigue, decreased lean body mass, increased abdominal adiposity, reduced exercise capacity, memory impairments, inability to concentrate, anxiety, and depression. These symptoms overlap considerably with deficits commonly observed in patients with TBI. The objective of this study was to investigate the incidence of untreated, posttraumatic hypopituitarism in patients admitted to a postacute brain injury facility.

## Method

Upon admission into the facility, basal hormone levels were assessed. Blood levels of thyroid, follicle stimulating hormone, luteinizing hormone, cortisol (AM and PM levels), testosterone, estradiol, and insulin-like growth factor-1 (IGF-1) were measured. It has been documented that the presence of low levels of IGF-1 increases the likelihood of growth hormone (GH) deficiency. For patients whose IGF-1 level was at least 2 SD below the mean of the reference range, a provocative glucagon stimulation test was conducted to investigate GH levels.

## Results

Preliminary data analyses have revealed that 58 patients with low levels of IGF-1 were admitted into the postacute, brain injury facility. Glucagon stimulation tests were subsequently completed in 16 of these individuals. Of these 16 patients, 38% (6 patients) had deficient levels of GH, requiring hormone replacement. One patient who has received GH replacement has been monitored closely to determine the effectiveness of GH in reducing abdominal adiposity, increasing exercise capacity, decreasing levels of anxiety and depression as well as increasing cognitive functioning in the areas of memory and attention.

## 0013

### Micromechanics Application for Axonal Injury Analysis in Brain Tissue

Nabi Abolfathi, Ghodrat Karami, Mariusz Ziejewski

North Dakota State University, Fargo

## Objectives

In areas such as corona radiata, axons are observed to have high undulation (Stephen and Waxman, 1995). To develop a more accurate model in the study, therefore, the undulation factor should also come into account. Previous studies have shown a resemblance of organic architecture of the human optic nerve with the guinea pig optic nerve (Bain et al., 2003; Waxman et al., 1995). In the present study, guinea pig optic nerve axons from a previous study of Meaney (2003) are considered to determine the impact of such undulations on the material property, as well as stress-strain distribution.

## Method

A computational micromechanics method for characterization and analysis of brain tissue and, in particular, the white matter of the brain was utilized. The method employed the microstructure characteristics as well as the mechanical properties of the individual elements constituting the tissue. The influence of various material and geometrical parameters such as the viscoelasticity, hyperelasticity, and undulations of the axons was examined. The study mainly focused on material modeling of a unit cell exhibiting the representative volume element of the tissue infrastructure.

## Results

The axon undulation had a large impact on how the stresses were distributed between the axon and the matrix. In all tensile and shear loading cases, the axons were observed to have higher stresses than the matrix, whereas the matrix attained higher strains than the axons. When the displacement load was applied in a direction that was perpendicular to the longitudinal axis of the axon, the stresses in the constituents were more evenly distributed than they were for a displacement along the longitudinal axis. The mechanical property variations due to undulation are significant enough to establish possible injury mechanical criteria.

## 0014

### Use of Low-Level Exercise to Improve the Physiologic Condition of Individuals With Post Concussion Syndrome

Barry Willer, John Leddy, David Pendergast, Karl Kozlowski

*University at Buffalo, Buffalo, New York*

## Objectives

1. To assess the reliability and safety of provocative exercise testing for patients with post concussion syndrome (PCS), where PCS is defined as symptomatic 6 or more weeks postinjury.
2. To assess the effectiveness of a low-level exercise program in reducing symptoms, assisting in return to work/school, and altering physiologic response to exercise.
3. To assess the impact of low-level exercise on neurological recovery using functional magnetic resonance imaging (fMRI) with specific attention to working memory and autonomic nervous system activation.

## Method

An exercise stress test was developed to assess the threshold at which PCS patients become symptomatic. Videos were

used to assess interrater reliability. A second assessment prior to treatment was used to assess retest reliability. After a baseline period, 12 patients with PCS were treated with low-level exercise (based on threshold of symptom exacerbation) and evaluated for changes in symptoms and physiology. Three patients were assessed with fMRI before and after treatment. Patients completed a simple working memory task and a second task designed to activate the sympathetic nervous system. A sample of noninjured controls was also assessed.

## Results

The exercise test was found to be safe and reliable. The use of low-level exercise for the treatment of PCS was effective. All patients returned to work/school and sport. Patients had gradual but significant reduction in symptoms, although there was considerable variability in recovery time. There was evidence that exercise improved autonomic nervous system regulation that might account for patient improvement. Functional imaging revealed marked improvement in the efficiency of brain metabolism in PCS patients posttreatment. After treatment, PCS patients performed the same as controls. There was limited evidence of similar changes in autonomic nervous system response.

## 0016

### Staff Views of the Causes of Behavioral Disregulation in Clients in a Program for Neurobehavioral/Neuropsychiatric Disability

Gordon Giles

*Samuel Merritt University, Oakland, California, and Crestwood Behavioral Health, Inc, Sunnyvale*

## Objectives

To examine the perceived causes of behavioral disregulation in a nonaversive program for persons with neurobehavioral/neuropsychiatric disability.

## Method

Sixty-three staff participants reported 463 unique aggressive incidents involving 45 clients of a neurobehavioral/neuropsychiatric program during a 6-week study period. Staff were interviewed within 72 hours of observing aggressive behavior. Qualitative methods were used to categorize the antecedents. Interrater reliability was assessed by the use of an independent rater recategorizing the interview data using the derived categories.

## Results

Interactions that resulted in aggression toward staff resulted from (a) frustration of the clients' self-assertion, (b) activity demand, or (c) staff physical intrusion. Aggression directed at peers was most often preceded by verbal confrontation or assault from the peer. The majority of assaults within this population as reported by staff appear to be either impulsive or expressive (intended to rectify affronts to self-image) and do not appear to be instrumental. More consideration may usefully be given to staff training regarding relationships, and how not to elicit impulsive aggression.

**0017****Education and Outreach in the 21st Century: Using Friends, Tweets, and Peeps to Build an Online Community**

Victoria Youcha

*WETA, Arlington, Virginia***Objectives**

1. Demonstrate how to help consumers use the Web to find authoritative information and social support.
2. Identify which social networking sites and existing groups provide trustworthy support and information to people with TBI and their families.
3. Identify how to use social networking to share information with TBI survivors and their families.
4. Demonstrate how to set up a private group on Facebook for consumers.

**Method**

The presentation expands upon a June 2, 2009, *New York Times* article, "Online, A Reason to Keep On Going," which described research on using online social networks with older adults to provide some of the benefits of a group of friends to similarly help those affected by brain injury stay connected. It explains how social networking sites such as Facebook, LinkedIn, Twitter, and YouTube are now being used by the brain injury community. Printed guidelines on setting up a Facebook group for consumers and additional online resources related to traumatic brain injury will be presented.

**Results**

After this session, participants will know

1. the latest on line resources available to the brain injury community,
2. how to use existing online communities to build social supports for consumers,
3. how to set up a secure group on Facebook, and
4. strategies for safely and creatively using social networking resources to help overcome the isolation that so often hinders the recovery of those with a brain injury.

**0018****Life as Therapy**

Rebekah Vandergriff, LMSW

*University of Central Missouri, Warrensburg, and Kansas Regents Center, Kansas University (KU), Overland Park***Objectives**

To familiarize attendees of the ingredients for a productive and successful life after traumatic brain injury (TBI). Delineate the 12 concepts in My Milestones as presented in the Appendix of a newly released memoir, "What Day Is It?" A Family's Journey Through Traumatic Brain Injury. To explain processes, concepts, examples, stories, and give experiences that families can use to provide a quality experience to each individual, and give hope and insight that can help survivors of traumatic brain injury improve long-term opportunities.

**Method**

A PowerPoint presentation will be used to tell the storyline in "What Day Is It?" A Family's Journey Through Traumatic Brain Injury. Participants will receive a copy of "Life as Therapy," which explains the concepts in My Milestones. This will provide a tangible list of ideas that can be used in service agencies, homes, clinics, and other settings to improve outcomes for people with brain injury.

**Results**

Participants will learn how to create healthy attitudes in clients, consumers, family members, or in anyone who has experienced the unimaginable results from brain injury. Tools will be provided to help people give their loved ones, clients, patients, or consumers increased success in educational, vocational, and other life areas.

**0019****Investigating Arousal and Anxiety Influences on Cognition in Individuals With Mild Head Injury**

Julie Baker, Dawn Good

*Brock University, St Catharines, Ontario, Canada***Objectives**

To examine the cognitive and emotional sequelae following mild head injury (MHI; eg, concussion) in high-functioning individuals. Research from our laboratory has demonstrated that university students with MHI report significantly lower levels of anxiety, are less responsive to stressors in their environment, and, correspondingly, are physiologically under aroused than their non-MHI cohorts. Underarousal in traumatic brain injury is associated with ventromedial prefrontal cortex disruption (Naqvi et al., 2004) and may be implicated in mild traumatic brain injury and MHI generally. In our current study, we investigated the possible neuropsychological benefits of increasing stress and arousal in persons with reported MHI.

**Method**

Using a quasi-experimental research design ( $N = 90$ ), changes in cognitive performance (executive functions: cognitive flexibility, memory processing, anticipation, planning skills, and selective attention) were examined as a function of manipulated arousal (ie, improves with induced activation/stress; worsens with reduced activation/relaxation) in individuals with subtle MHI (ie, self-reported previous head injury resulting in an "altered state of consciousness"; PCSC). Data were compared to those without a history of MHI. In addition to self-reported stress and state anxiety measures, physiological indices of arousal state (ie, electrodermal responsivity, heart rate, and respiration activity) were recorded (via Polygraph Professional Suite, 2008) across a 2-hour interval.

**Results**

Upper-year university students with a reported history of mild head trauma (sports, falls) reported experiencing more postconcussive symptoms in terms of intensity, duration, and frequency, particularly for concentration, judgment, irritability, and headaches. Results support the original findings that individuals with a history of MHI are physiologically and

emotionally underaroused compared with their non-MHI cohort despite increased reports of experiential stressors. Furthermore, manipulated stress differentially affects persons with and without MHI. Cognitive flexibility, attention, and processing speed are advantaged with increased stress, and disadvantaged with reduced stress, in persons with MHI, but not so in those without reported MHI.

## 0020

### The Epidemiology of Traumatic Brain Injury in a Rural Southeastern State: The Challenges of Statewide Health Data Collection for Treatment Services

Robert Granacher, Tonia Wells

*Traumatic Brain Injury Trust Fund, Commonwealth of Kentucky, Frankfort*

#### Objectives

Analysis of diagnostic and treatment trends within a statewide data collection system for inpatient and outpatient traumatic brain injury (TBI) cases in Kentucky.

#### Method

Statewide inpatient data for calendar year 2006 and outpatient data for calendar year 2008 were collected using ICD-9 diagnostic coding, discharge status, age, and payor. Analyses were performed by utilizing a Johns Hopkins University software system (ICDMAP-90). Injury severity scores and abbreviated injury scores (AIS) were calculated. Head injuries were ranked by severity of injury and characterized by type. Analyses to determine long-term disability were undertaken using maximum AIS of severe or higher. Age deciles were used to group severity scores and discharge status.

#### Results

The data revealed that two-thirds of skull fractures, cerebral lacerations, cerebral contusions, and intracranial hemorrhages were coded by AIS severe or higher. Intracranial hemorrhage was the majority diagnosis in the inpatient population. The second most frequent inpatient diagnosis was concussion. Over one-third of inpatient TBI diagnostic codes were billed to Medicare while for outpatient TBI cases the largest billing group was commercial insurance. There is a significant need to reduce variance in TBI coding in order to improve the planning of statewide healthcare services for TBI patients.

## 0021

### School Reintegration for Children and Youth With Acquired Brain Injury

Dawn Good<sup>1</sup>, Peter Rumney<sup>2</sup>, Janette McDougall<sup>3</sup>, Sheila Bennett<sup>1</sup>, Rhonda Martinussen<sup>4</sup>, Carole DeMatteo<sup>5</sup>, Patricia McKeever<sup>4</sup>, Denise Guerriere<sup>4</sup>, Sue Loyst<sup>6</sup>, John Kumpf<sup>7</sup>, Nancy DeCourville<sup>1</sup>

<sup>1</sup>Brock University, St Catharines, Ontario, Canada, <sup>2</sup>Bloorview Kids & University of Toronto, Toronto, Ontario, Canada, <sup>3</sup>Thames Valley Children's Hospital, London, Ontario, Canada, <sup>4</sup>University of Toronto, Toronto, Ontario, Canada, <sup>5</sup>CanChild McMaster University, Hamilton, Ontario, Canada, <sup>6</sup>Elementary School Principal & System Special Education Principal (retired), North Bay, Ontario, Canada, <sup>7</sup>Ontario Brain Injury Association, St Catharines, Ontario, Canada

#### Objectives

To determine the limitations and barriers to successful school reintegration for children and youth living with the effects of ABI via quantitative evaluation of student, educator, and school-based factors using standardized measures. Statistically verify student variables (preinjury academic status, impairment measures, postinjury physical, and neurocognitive abilities) with educator's awareness, attitude, and educational approach. Determine if programming support and environmental priorities of the school may be predictive of improved performance for this specialized population in terms of their outcomes for school adjustment, classroom participation, sense of school membership, and academic competence.

#### Method

Using a multicentered approach, currently enrolled Ontario students between ages 6 and 18 (and their associated family, teacher(s), and the principal) who have experienced a moderate or severe ABI, are at least 2 years postinjury, and have returned to their community school environment are identified by our partner centers. Students, parents, educators, and administrators complete comprehensive tests measuring school performance, social integration, cognition, behavioral/emotional status, physical ability of the student, and educational approaches and protocol of the school environment. Hierarchical regression analyses are identifying those factors that best predict success in the classroom for students with moderate to severe ABI.

#### Results

Our research aims to identify those variables and school/systemic factors that influence and alter successful scholastic experiences and reintegration of students who have experienced ABI. These results have implications for transitional follow-through, school policy, and future outcomes for students with the capacity to return to the social and educational opportunities in the classroom.

## 0022

### Effects of Acute Aerobic Exercise on Neurocognition After Traumatic Brain Injury

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#### Objectives

The physical and mental health benefits of long-term chronic aerobic exercise are well-established. Regarding neurocognitive function, controversy exists on the effects a single bout of aerobic exercise has on memory, attention, processing speed, and reaction time. No studies have been performed in patients recovering from traumatic brain injury who experience a variety of cognitive impairments. Therefore, the purpose of this study was to determine if changes (positive or negative) occurred in neurocognitive status when a cardiorespiratory exercise training session was performed immediately prior to neurocognitive testing.

## Method

Participants were 18–60 years of age enrolled in a postacute residential treatment center. Volunteers were randomly assigned to either a control ( $n = 20$ ) or an experimental (exercise) group ( $n = 19$ ). Both groups completed neuropsychological tests of (1) verbal memory, (2) visual tracking and scanning, (3) selective and sustained attention, and (4) reaction time on 2 occasions approximately 1 week apart. The exercise group was retested immediately after 20–30-minute bout of cardiorespiratory training at an intensity equal to 60–75% of their age-predicted maximum heart rate. Two-way analyses of variance (ANOVA) assessed group-by-time interaction ( $\alpha$  level = .05).

## Results

Acute exercise was shown to improve automatic detection speed ( $P < .001$ ) and controlled search speed ( $P = .026$ ) on the Ruff 2 & 7 Selective Attention Test. The ANOVA revealed no statistical difference in the interaction between group and time for the other measures. However, for all tests, participants who exercised performed the same or better than those who did not. None of the tests indicated that acute exercise was detrimental to neurocognitive status in these patients. Further study of acute bouts of exercise is warranted in light of the implications for postacute residential treatment planning.

## 0023

### Neuropsychological Assessment Battery: Performance in a Sample of Patients With Moderate to Severe Traumatic Brain Injury

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## Objectives

The Neuropsychological Assessment Battery (NAB; Stern & White, 2003) is a comprehensive test battery that assesses 5 cognitive domains (attention, language, memory, spatial, and executive functions). The goal of increasing our understanding of this recently developed test battery in a variety of neurological populations with different test administration approaches is a useful one. The purpose of the current study was to present descriptive data on the 5 main NAB cognitive modules in a sample of individuals with traumatic brain injury (TBI) using a conservative administration approach (as per the NAB testing manual).

## Method

All 5 main NAB cognitive modules (administered only if “recommended” by the NAB Screening module) were administered to a sample of individuals ( $N = 20$ ) with moderate to severe TBI admitted to a residential post-acute brain injury rehabilitation facility. Mean age of the sample was 34.7 (SD = 15.0) and mean educational attainment was 12.8 years (SD = 1.9). Exclusion criteria included (a) history of a prior neurological disorder, and/or psychiatric disorder, (b) lack of fluency in English, or (c) presentation of an aphasia syndrome.

## Results

The current study is the first, to our knowledge, to describe the performances on all 5 main NAB cognitive modules to this sample population. The sample population performed significantly worse than normal on subtests that assess selective and divided attention, psychomotor speed, verbal memory, and cognitive flexibility. The largest proportion of patients performing below an established impairment cutoff (10th percentile) occurred on the Numbers and Letters, List Learning, Story Learning, Daily Living Memory, and Categories subtests. Significant performance decrements were not observed on any variables from the Language or Spatial cognitive modules. The pattern of performance demonstrated by the current sample is consistent with the neuropsychological profile observed in postacute patients with moderate to severe TBI without aphasia, demonstrating its sensitivity in this patient population.

## 0024

### Long-term Recovery in Persons With Complex and Catastrophic Brain Injuries

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## Objectives

Recovery gains, particularly those of persons who have experienced “slow[er] to recover” or “complex” catastrophic neural injuries, are often difficult to discern or describe because of limitation in opportunities for intensive data gathering and tracking, especially over the long term. Many of these challenges are lessened within the residential rehabilitation setting where individuals are receiving ongoing active treatment or long-term living support 24 hours a day.

## Method

In this venue, extensive data were collected while tracking goals and charting behavior on a daily basis and over long periods of time (ie, up to 13 years) depicting the trajectories of recovery and outcome of persons with severe traumatic brain injury. Durations of stay were categorized into 6 groups of 2 years (1–3, 3–5, 5–7, 7–9, 9–11, and 11–13 years). A total of 12 case studies are presented including 2 case studies from each duration of stay group.

## Results

Documented gains/changes observed across long periods of time (ie, years) were conservative, but evident, emerging at unexpected intervals and at abrupt times, and conclude with varying, but improved, levels of independence and reintegration. Accumulated longitudinal data for “functional” neuropsychological measures, both qualitative and quantitative, representing 3 areas of recovery—cognitive, physical, and social/emotional—are presented.

## 0025

### Motor-Evoked Potential Amplitudes Are Correlated With Prior Number of Concussions in the Acutely Concussed Collegiate Athlete

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<sup>1</sup>George Washington University, Washington, DC, <sup>2</sup>University of Virginia, Charlottesville

### Objectives

To determine if motor-evoked potential (MEP) abnormalities in the acute period following concussion are correlated with prior concussion history.

### Method

A matched-cohort, time-series, correlational design was used. Subjects were 9 collegiate athletes (3 women and 6 men, age  $20.0 \pm 0.87$  years, height  $177.4 \pm 7.6$  cm, mass  $78.5 \pm 6.5$  kg) with acute concussion (<24 hours since the time of injury). Transcranial magnetic stimulation was applied over the motor cortex with MEPs recorded from the contralateral upper extremity. History of prior concussions was obtained by a self-report questionnaire. Subjects were tested on days 1, 3, 5, and 10 postinjury. Main outcome measures were MEP threshold to stimulation, MEP latency, MEP amplitude (normalized to Mmax amplitude), central motor conduction time (CMCT), and self-reported prior number of concussions.

### Results

Mean prior number of concussions was  $1.7 \pm 1.9$ . The prior number of concussions was significantly positively correlated with MEP amplitudes on days 1 ( $R = 0.86$ ,  $P = .003$ ), 3 ( $R = 0.94$ ,  $P = .002$ ), and 5 ( $R = 0.79$ ,  $P = .011$ ). MEP thresholds, latencies, and CMCT were not significantly correlated with the previous number of concussions ( $P > .05$ ). Ulnar MEP amplitudes were not significantly correlated with the previous number of self-reported concussions ( $P > .05$ ). High variability of MEP amplitudes to single-pulse TMS in the acute post-concussive period was strongly correlated with prior concussion history. Athletes with a higher number of previous concussions demonstrated increased MEP amplitudes and greater MEP variability.

## 0026

### Integrative Customized Approach for Recovery: Using Neurofeedback, Sound, Water, Speech/Language, Physical and Cognitive Therapy

Diane Stoler

United States

### Objectives

Each person is unique and one method of treatment does not fit all. An integrative team approach to health for recovery of brain injury will be presented that draws from the best practices in conventional and alternative services including neuropsychology, brain mapping, neurofeedback, the Tomatis Method, physical therapy, cranial sacral therapy, reflexology, water therapy, nutrition education, and therapeutic massage. On the basis of a 5-prong approach and using an evidence-based assessment of these therapeutic interventions, we are able to customize an individual rehabilitation program for recovery of brain injury.

### Method

The presentation will introduce

1. topic/history of the speaker;
2. a general understanding of brain, brain injury, and second-impact syndrome;
3. a general understanding of consequences from brain injury (video);
4. differential diagnosis-depression/mood;
5. differential diagnosis symptoms: post concussive syndrome, posttraumatic stress disorder; reactive grief;
6. an understanding of neurophysiology of brain injury;
7. a general understanding of each modality;
8. a general understanding of how modalities can work for specific symptoms;
9. a general understanding of how various modalities can work together;
10. exploring what modality can be used for a specific symptom or symptoms;
11. a general understanding of the use of neurobiofeedback; and
12. lifecare cost for treatment/outcome.

### Results

Participants will gain a greater understanding of brain injury and brain/body interaction and how to develop a customized program for recovery using an integrative approach of various modalities and how to have an evidence-based method of assessing those approaches and outcomes, thus providing a customized program that is cost-effective.

## 0027

### Can the APB2000 Be Used to Stimulate the Brain and Body to Communicate More Efficiently in Subjects Suffering TBI Caused by Blast Waves as well as Other Symptoms Related to Brain Injuries?

Diego Guillen, Jonathan Killian

Loma Linda University, Loma Linda, California

### Objectives

Brain injuries affect each individual differently and sadly can be undetectable, undiagnosed, and misdiagnosed. Brain injury is a physical injury much like a muscle injury. For the best recovery, the brain must be stimulated objectively. Everyday living involves the mind and body working together. In this study, we used the Automated Peg Board 2000 (APB2000) to stimulate the mind to recognize process and communicate better with the body, thus working more efficiently together as in healthy living. The APB2000 has been found to be a highly reliable tool to measure performance time in both the pathological and nonpathological populations.

### Method

The APB2000 consists of a computer-driven panel containing colored shaped pegs in precisely located sockets. It measures display time (time taken by the subject to read the instructions given by the computer and then remove the designated peg from its place), distance time (time to remove the single peg and place it in the designated vacant slot), and the

return time (time to hit the home switch after placing the peg in its slot) for each move. The computer also measures the total trip time (time taken by the subject to complete all 21 moves) during a single trial.

### Results

Diminished skill resulting from brain injury varies by individual. Each subject's results showed improvement in cognitive and motor performance. Individual test scores demonstrated increases in ability to focus, comprehend, and react to instructions of tests. Scores also illustrated left- and right-sided brain performance comparisons as well as left and right upper-body motor control ability/skill/function compared to initial baselines for each subject. Medication influences such as that of Tegretol used to control seizures and effects of Zoloft versus Paxil when used for depression were also seen on test results. The APB2000 provided objective cognitive and motor control assessment.

### 0028

#### Using Interactive Multimedia to Teach Parent Advocacy Skills

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### Objectives

Because prior to the injury, most children with TBI progressed typically through schools, parents are often unfamiliar with their role and rights in the educational process and need assistance to access effective school-based interventions. This presentation will describe research examining the efficacy of an Internet-delivered intervention to improve parental advocacy skills in the educational context. Two studies will be described: a random controlled trial with a national sample and a single-subject study with behavioral observation of skill application.

### Method

Study 1 employed a randomized controlled design with a national sample of parents of children with TBI. Parents completed pretraining measures, had access to the training program for 2 weeks, and then completed post and follow-up measures. Outcome measures included knowledge, intention, and self-efficacy items, including video scenarios of typical parent-educator interactions. Study 2 utilized a multiple-baseline design, with ratings of communication skills in role-play scenarios as the primary outcome measure. Four parents of children with disabilities completed baseline role plays over at least 3 weeks, viewed the program in 2 sessions, and then completed posttraining and follow-up role plays.

### Results

Results from Study 1 will include analyses of between-groups comparisons on computer-delivered assessments. Results from Study 2 will include graphic presentations of the percentage of effective communication skills demonstrated during role-play scenarios.

### 0029

#### The Therapeutic Effect and Mechanism of Urinary Trypsin Inhibitor on Patients With Traumatic Brain Injury

Ming-kun Yu, Kai-lei Wang

*The Second Military Medical University, Shanghai, China, and Institute of Neurosurgery, Chang zheng Hospital, Shanghai, China*

### Objectives

Exploring the therapeutic effect and mechanism of urinary trypsin inhibitor on patients with traumatic brain injury (TBI).

### Method

Twenty-two patients with TBI, admitted to our hospital within 24 hours postinjury, were chosen into our research group and received an intravenous injection of 200 thousand units of urinary trypsin inhibitor, twice a day from the first to the seventh day. Thirty-six patients with TBI who did not receive treatment of urinary trypsin inhibitor were chosen as control group. The values of plasma CD3<sup>+</sup>, CD4<sup>+</sup>, CD8<sup>+</sup>, CD4<sup>+</sup>/CD8<sup>+</sup>, CD34<sup>+</sup>, NK cell and CRP, NSE, and complement C3 were examined in all of these patients at the first, third, fifth, and seventh days postinjury.

### Results

Compared with the control group, plasma CD3<sup>+</sup> of patients in research group was decreased greatly in the fifth day, CD4<sup>+</sup> increased greatly in the fifth and seventh days, CD8<sup>+</sup> decreased in the fifth and seventh days, CD4<sup>+</sup>/CD8<sup>+</sup> elevated in the fifth and seventh days, and CD34<sup>+</sup> decreased in the first day, while higher than that of the control in the third and fifth days. NK cell was proved higher than that of the control in the fifth and seventh days. The result showed that patients treated with urinary trypsin inhibitor have a better outcome.

### 0030

#### The Application of Behavior Analysis-Based Therapies and Principles in the Treatment of Weight-Related Issues in America's ABI Population

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<sup>1</sup>Center for Comprehensive Services, Carbondale, Illinois, <sup>2</sup>Southern Illinois University, Carbondale

### Objectives

1. Provide insight to the increasing problems and difficulties facing Americans and specifically persons with acquired brain injury with respect to weight-related issues.
2. Description of behavior-analytic and cognitive-behavioral therapy (CBT) processes involved in the development, implementation, and maintenance of weight-loss programs in the ABI population
3. Present outcome data for 4 participants as well as provide possible manipulations to the current therapy protocols that will likely further facilitate adherence to and success of the treatment.

## Method

Participants first completed the Eating Functional Assessment and the Acceptance and Action Questionnaire-Weight prior to their participation in the experiment. Subsequently, participants' height and weight were taken. Participants had one 60-minute session each week for 4 weeks with primary emphasis on CBT. CBT sessions targeted the possible functions of eating and food choices, increasing awareness to alternative behaviors to that of eating, assertiveness training, and coping with urges. Participants were weighed each week so as to determine any changes in weight. At the follow-up, participants again completed the EFA and AAQ-W.

## Results

Results indicate small, healthy changes in participants' weight and body mass index, as well as statistically significant changes in both the functions of the EFA and the AAQ-W. Self-report of food intake as well as exercise expenditure likely facilitated their awareness of their eating (whether healthy or unhealthy) and may have accounted for some of the decreases in weight that resulted. Implications of significant decreases in the EFA and AAQ-W scores are that there are likely underlying psychological processes at work that are imperative to maintaining weight loss subsequent to the removal of treatment.

## 0031

### Neurotherapy for Chronic TBI/PTSD Symptoms in Vietnam Veterans

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<sup>1</sup>Sam Houston State University, Huntsville, Texas, <sup>2</sup>Neurotherapy Center of Washington, Bethesda, Maryland

## Objectives

We have previously demonstrated the potential of a novel form of neurotherapy that involves stimulation of brain wave activity with minute electromagnetic (EM) pulses for the amelioration of traumatic brain injury (TBI) and associated post-traumatic stress disorder (PTSD) symptoms in service personnel returning from the Afghanistan and Iraq wars. The purpose of this report is to summarize findings suggesting that applying the same treatment protocol in long-standing conditions of mixed TBI and PTSD symptoms has the potential to provide the same kind of improvement.

## Method

Two veterans with very persistent, debilitating TBI and PTSD symptoms dating from their involvement in the Vietnam War were seen in 25 individual treatment sessions over 3 months. Each was treated with an adaptation of the Flexyx Neurotherapy System (FNS) that uses very tiny, subliminal pulses of EM energy to stimulate changes in brainwave activity by adding a fixed amount of EM stimulation to the momentary peak EEG frequency at multiple electrode placement sites in a predetermined order. Symptom questionnaires and rating scales were completed at pre- and posttreatment, as well as individual symptom rating scales at each treatment session.

## Results

Both veterans experienced significant reductions in both-ersome cognitive and affective/emotional symptoms and improvements in energy level, sleep, and other aspects of psychosocial functioning from pre- to posttreatment. This corresponded with their spontaneously offered subjective reports of improvement in multiple domains of cognitive, emotional, and psychosocial functioning. FNS as adapted for use in this project appears to offer promise for potentially similar reduction of bothersome symptoms in chronic, complicated cases of mixed TBI/PTSD as has been previously demonstrated in persistent, though less chronic, conditions.

## 0032

### Teaching Persons With Brain Injury How to Manage Their Behavior: Reinforcement for Self-control

Michael Mozzoni, BCBA, CBIST, Dixie Eastridge BCBA

Learning Services, Lakewood, Colorado

## Objectives

This presentation will focus on strategies designed to teach prosocial skills and emotional control to persons with ABI through the use of Differential Reinforcement of Alternative and Differential Reinforcement of Other behaviors embedded in a faded stepped level system. Participants will learn about Differential Reinforcement, how to identify and set up a reinforcement system, and how to train staff how to utilize and document the system

## Method

Four persons with ABI within a neurobehavioral treatment program took part. A multiple baseline and A-B single-subject design was used as treatment did not begin at the same time for all subjects. Individual reinforcers were identified through preference assessment. Three token cards of differing color and values were constructed to reinforce prosocial, self-control with challenge and replacement behaviors. The more important behaviors (prosocial, self-control with provocation) were reinforced with token cards of greater value, which could be cashed in for different levels of reward. Staff training was intensive and ongoing through modeling, review, and problem solving with staff.

## Results

All 4 subjects demonstrated significant gains in prosocial and self-control behaviors with corresponding decreases in aggression, property destruction, and refusals to follow therapeutic instructions. Therapeutic intensity was faded as higher levels through longer duration of self-control were demonstrated.

## 0033

### Event-Based Prospective Memory Performance During Subacute Recovery Following Moderate to Severe TBI in Children: Effects of Monetary Incentives

Stephen McCauley<sup>1</sup>, Sandra Chapman<sup>2</sup>, Ana Vasquez<sup>2</sup>, Claudia Pedroza<sup>3</sup>, Harvey Levin<sup>1</sup>

<sup>1</sup>Baylor College of Medicine, Houston, TX, <sup>2</sup>University of Texas at Dallas, Dallas, <sup>3</sup>University of Texas Medical School–Houston, Houston

### Objectives

There are very few studies investigating remediation of event-based prospective memory (EB-PM) impairments following traumatic brain injury (TBI). To address this, we used 2 levels of motivational enhancement (dollars vs pennies) to improve EB-PM in children with moderate to severe TBI in the subacute recovery phase.

### Method

Children with moderate or severe TBI were enrolled in a prospective longitudinal study of outcome following TBI. Participants were assessed as soon as practicable after resolution of posttraumatic amnesia. Using a cross-over design, children with orthopedic injuries (OI;  $n = 61$ ), moderate TBI ( $n = 28$ ), or severe ( $n = 30$ ) TBI were compared on EB-PM performance in high- vs low-motivation conditions. Age-at-Test and Time-Postinjury effects were investigated.

### Results

Significant effects were found for Age-at-Test ( $P = .01$ ), Time-Postinjury ( $P = .0007$ ), Group ( $P < .0001$ ), Period ( $P < .04$ ), Condition ( $P = .02$ ), and Group  $\times$  Condition ( $P < .03$ ). The OI group outperformed both the moderate ( $P < .04$ ) and severe ( $P < .0001$ ) TBI groups and moderates outperformed the severe group ( $P < .03$ ). The OI ( $P < .002$ ) and moderate TBI ( $P < .03$ ) groups performed significantly better under the high- vs low-incentive condition; however, the severe TBI group failed to demonstrate improvement ( $P = .38$ ). EB-PM scores were positively and significantly related to Age-at-Test and Time-Postinjury. These results indicate EB-PM can be significantly improved in the subacute phase in children with moderate, but not severe, TBI.

## 0035

### Sexuality and Brain Injury: A Comparative Content Analysis Inquiry of Survivors and Professionals

Barbara Barton

Western Michigan University, Kalamazoo, Michigan

### Objectives

- Identify the physical and psychosocial adjustment issues that influence this important quality-of-life area.
- Understand the key issues of this multidimensional construct as reported by brain injury professionals.
- Learn about key sexual health concerns as expressed by survivors.
- Learn techniques and models that address the redevelopment of healthy sexuality.
- Explore an interdisciplinary staff approach to support the sexual health of consumers and their partners.

### Method

The sexual health of survivors at all levels of cognitive functioning is often ignored or interpreted as problematic behavior. Participants will be informed of the results of a comparative study that investigated sexuality issues as expressed by survivors

as well as by professionals. Case examples will be used to illustrate the concepts of maladjustment and healthy functioning.

### Results

Survivors of brain injury often need coaching and education in how to address interpersonal relationships, socialization, and the appropriate expression of affect that influence sexual health. Body image and self-esteem issues, and the cognitive and physical effects of the injury, can influence adjustment. Also, the training and attitudes of the treatment team influence successful integration of this psychosocial issue into an individual's, and his or her partner's, recovery.

## 0036

### Specific Kv1.3 Blocker Acts as a Novel Therapeutic Strategy in Brain Injury Induced by Irradiation

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<sup>1</sup>The Second Affiliated Hospital of Sun Yat-Sen University, Guangzhou, Guangdong, China, <sup>2</sup>Bachem Bioscience Inc, King of Prussia, Pennsylvania

### Objectives

It has been indicated that activated microglia may secrete pro-inflammatory factors and cause chronic inflammation in radiation-induced brain injury. The aim of this study was to investigate the role of microglia in radiation-induced brain injury and also examine whether the specific Kv1.3 blocker-ShK(L5) of microglia could prevent brain injury induced by irradiation.

### Method

BV-2 cells (microglia cell line) were irradiated with a single dose of 10 Gy in vitro. BALB/c mice received whole-brain irradiation with a single dose of 30 Gy. ShK(L5) was applied to the animals from the day of radiation with dosage of 100  $\mu\text{g}/\text{kg}/\text{d}$  for 7 consecutive days. Pro-inflammatory factors including TNF- $\alpha$ , IL-6, and COX-2 were estimated with ELISA in vitro. The mRNA expression of TNF- $\alpha$  and IL-6 with and without ShK(L5) were determined by PCR. The level of Kv1.3 was determined by Western blotting.

### Results

In vitro studies showed that after radiation, the BV-2 cells (microglia cell line) upregulated Kv1.3 accompanied with over-expression of the pro-inflammatory factors TNF- $\alpha$ , IL-6, and COX-2. We compared the time course and the level of the pro-inflammatory factors as well as the pathophysiology of radiation-induced brain injury with and without the application of ShK(L5) in vivo. Secretions of IL-6 and TNF- $\alpha$  were significantly inhibited in ShK(L5)-treated animals, in comparison to the radiation control. These data provide a rationale for developing specific Kv1.3 blockers as a novel therapeutic strategy for the prevention of brain injury induced by irradiation.

## 0037

### Patterns of Cortical Thinning in Relation to Event-Based Prospective Memory Performance of Children With Traumatic Brain Injury

Stephen McCauley<sup>1</sup>, Tricia Merkley<sup>2</sup>, Elisabeth Wilde<sup>1</sup>, Kathleen Schnelle<sup>1</sup>, Erin Bigler<sup>2</sup>, Ana Vasquez<sup>1</sup>, Jill Hunter<sup>1</sup>, Zili Chu<sup>1</sup>, Sandra Chapman<sup>3</sup>, Harvey Levin<sup>1</sup>

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### Objectives

Prospective memory (PM) is the formation of an intention and remembering to perform this intention at a future time or in response to specific cues. One type of PM task is event-based prospective memory (EB-PM) in which an intention is executed in response to a specific environmental cue, such as giving a message to a friend when seen next. While PM tasks are common part of daily life for children and adults alike, there is little data regarding PM impairments in children with traumatic brain injury (TBI) and none concerning their relation to brain volumetrics.

### Method

This study investigated EB-PM in children (7–17 years) with moderate to severe TBI ( $n = 40$ ) compared with children with orthopedic injuries only (OI;  $n = 41$ ). As part of a prospective longitudinal study of children and adolescents, participants performed a naturalistic EB-PM task (making a verbal response to a specific verbal cue) and underwent neuroimaging at 3 months postinjury. Data were analyzed using the QDEC procedure using FreeSurfer software tools. Areas of significant thinning were correlated with EB-PM performance after adjusting for age at testing.

### Results

Compared with children with OI, children with TBI demonstrated significant cortical thinning in the regions of the middle and inferior temporal lobe, inferior frontal lobe, parahippocampal gyrus, and right dorsolateral prefrontal cortex. These areas correlated significantly with EB-PM performance and are generally consistent with findings from other studies of PM using functional imaging techniques that have identified frontal and temporal areas as important in EB-PM performance.

## 0038

### Narrative Interviews With Family Members of a Traumatic Brain Injury Survivor: A Qualitative Inquiry

Nicole Andreatta, Jan Ewing

California School of Psychology, San Diego

### Objectives

The purpose of this study was to learn more about the experiences of family members of individuals with a traumatic brain injury (TBI) in the hope of better serving this population. Moreover, we were interested in the potential of narrative practices to help families envision preferred futures and build communities of support for the enactment of new lives after head injury. Ensuring that practice, support, and services were informed by the families whom they sought to serve. It is necessary to conduct further research to explore current service provisions and investigate those aspects deemed important to families of TBI survivors.

### Method

Qualitative interviews informed by narrative practices were used to explore questions regarding the experiences and perceptions of the immediate family members of a TBI survivor 3 to 5 years postinjury. The term narrative practice refers to a set of ideas, attitudes, and practices rooted in a narrative/social constructionist worldview (Freedman & Combs, 1996). Four families participated in the study. Narrative interviews were utilized to produce a more robust understanding of family reactions to TBI over time and available resources needed both within and outside the family unit (Camplair et al., 1990) as well as to establish praxis (Ewing, 2007).

### Results

Results showed that families would benefit from therapeutic conversations that open up space for new possibilities, build relationships, identify strengths and resources, socially legitimize grief, and invite exploration of their preferred futures and identities. Techniques regarding how the identified themes can serve as points of entry into therapeutic conversations that may be helpful to families living with a person with TBI.

## 0039

### Brain Injuries in College Students

Adele Proctor

University of Illinois, Champaign

### Objectives

1. To present preliminary evidence of the high frequency of occurrence of brain injuries in college students who are not Veterans.
2. To present evidence supporting the need for additional research on college students with brain injuries.

### Method

A 30-item questionnaire was designed and distributed to undergraduate students from diverse backgrounds at a large Midwestern university. Twenty-three items were designed to determine students' knowledge and understanding of traumatic brain injury (TBI), whether students had personally experienced a brain injury and/or knew someone who had experienced a TBI and how the injury was treated. An additional 7 items requested demographic information such as self-identification of race/ethnicity and age. Participants consisted of a total of 132 (31.82% males; 66% females) with a mean age of 20.3 (SD = 1.42) years.

### Results

Of the total sample, 30.30% reported personally experiencing a brain injury. For 58.14% of this subsample, treatment was received in an emergency room, clinic, doctor's office, an athletic training room, or on the field. Of the 132 students, 11.36% reported a concussion with 60% of this subsample experiencing one concussion while 13% reported having had 5 concussions. Of the total sample, 40.15% knew someone who experienced a brain injury with 45.28% reporting the person to be a friend and 43.40% reporting the person to be a family member.

**0040****Helicopter Emergency Medical Services Transport Is Associated With Reduced Mortality in Injured Adults With TBI**

Mark Faul, Ernest Sullivent, Marlena Wald, Likang Xu

*Centers for Disease Control and Prevention, Atlanta, Georgia***Objectives**

Civilian helicopter emergency medical services (HEMS) have played a role in the transport of injured patients since 1967, with increasing numbers of HEMS providers and aircraft committed to this practice ever since. Outcome studies have yielded mixed results. Although studies have examined the relationship between the mode of trauma patient transport and outcomes in local and regional systems, no large national study of this relationship has been published. There is no literature on HEMS for TBI patients.

**Method**

Data for 8553 injured adults aged  $\geq 18$  years transported to 95 US trauma centers by helicopter or ground ambulance were obtained from the 2007 National Trauma Data Bank research data set. In-hospital mortality was calculated for different demographic and injury severity groups. Odds ratios were produced by utilizing a logistic regression model measuring the association of mortality and type of transport, controlling for age, gender, and injury severity (Injury Severity Score [ISS], Revised Trauma Score [RTS]).

**Results**

The odds of death were higher in those transported by ground vs helicopter (OR = 1.34, 95% confidence interval [CI] = 1.017–1.778) ( $P < .0376$ ). HEMS made up 20.6% of all the transports studied. More patients younger than <55 years were transported by helicopter (18.2%) compared with those 55 years or older (10%). Severely injured patients were transported by helicopter more frequently than those nonseverely injured (29% vs 12%). Odds of death significantly increased with age (OR = 1.015, CI = 1.003–1.026) and each unit of ISS (OR = 1.084, CI = 1.074–1.095) and decreased with each unit of RTS (OR = 0.427, CI = 0.400–0.456).

**0041****Conversational Discourse Following Closed Head Injury: A Preliminary Investigation Into Attention Training and Conversation Analysis Procedures**Kathleen Youse<sup>1</sup>, Mackenzie Gathof<sup>1</sup>, Heather Bush<sup>1</sup>, Rachel Fields<sup>1</sup>, Jennifer Noffsinger<sup>2</sup><sup>1</sup>University of Kentucky, Lexington, <sup>2</sup>Cardinal Hill Hospital, Lexington, Kentucky**Objectives**

Research regarding individuals with closed head injuries (CHI) has shown a pattern of deficits involving attention, memory, and executive functioning, which may result in decreased effective communication, for example, during conversation. Poor conversational ability can have a negative influence on educational, vocational, familial, and social pursuits

leading to chronic social isolation. The present study investigated the use of direct attention training following CHI to determine if improved attention may lead to improved conversation ability. Results from 2 individuals were analyzed utilizing 2 analysis procedures to determine which may be more useful in characterizing conversational ability of individuals in this population.

**Method**

The present study investigated 2 individuals from a larger pool of participants to evaluate methodological procedures. Pre- and posttesting included the Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001) and the Attention Process Training Test (Sohlberg, Johnson, Paule, Raskin, & Mateer, 1994). Three conversational samples were also taken at baseline and posttreatment. Training was completed utilizing the Attention Process Training program (Sohlberg et al., 1994). Conversational samples were taken once each week. Conversations were analyzed using 2 analysis schemes: Response Appropriateness (Coelho, Youse, & Le, 2002) and a Modified Response Appropriateness paradigm designed for this study.

**Results**

Results from the assessment measures differed for each individual; one made substantial progress while the other did not. Results from the original Response Appropriateness analysis procedure suggest it may not be representational of communication ability of individuals with CHI; therefore, using a Modified Response Appropriateness analysis system would provide more information. Modifications account for single-word responses that do not contribute to the conversation and for pauses or unintelligible responses that change the tenor of the conversation. This information may provide clinicians with a hierarchy of ability to guide treatment decisions for individuals with CHI as they progress through rehabilitation.

**0042****Late Cerebral Changes due to Carbon Monoxide Intoxication, Assessed With Positron Emission Tomography, and Diffusion Tensor Imaging—A Case Report**

Joseph Wu, Ylva Lilja

*UC Irvine, Irvine, California***Objectives**

Carbon monoxide intoxication (COI) has been proven to cause damage in the white matter of the brain, with decrease in fractional anisotropy (FA). Positron emission tomography (PET) studies have shown a decrease in brain metabolism, which remains in the majority of COI patients many years after exposure. To our knowledge the studies of COI using diffusion tensor imaging (DTI) have so far been focusing on cerebral changes within and around the first year of exposure. In this case report we are looking at the PET and DTI results 5 and 7 years, respectively, after exposure, to explore and compare remaining long-term deficits at this stage.

## Method

The subject is an otherwise healthy woman who suffered COI in her mid-thirties. Neuropsychological examinations primarily showed deficits in executive function, attention, and memory. High-resolution FDG-PET was obtained from the COI subject 5 years after exposure. The COI subject's PET scan was compared with PET scans of 20 controls, creating z-maps. DTI was performed on the COI subject 7 years after exposure. The raw data files were then converted to FA-maps and tractography, and in a second step they were normalized into MNI space. The FA-map of the COI subject was compared to 4 controls, creating z-maps.

## Results

The z-maps of the PET scans showed overall decrease in metabolism in the COI subject in both cortical and subcortical areas ( $P < .05$ ). The z-maps of FA-maps showed areas of decrease in the COI subject's orbitofrontal region ( $P < .05$ ) and areas of increase in the occipital lobe ( $P < .05$ ), finding that corresponds well with the tractography. These results suggest decreased FA in frontal areas, corresponding well with prior studies of early changes due to COI. However, the increase of FA in the occipital lobe has not previously been seen. It could be hypothesized that this is a late change and a long-term compensation.

## 0043

### Neural Correlates of Event-Based Prospective Memory in Children 3 Months After Moderate to Severe Traumatic Brain Injury: A Volumetric Study

Stephen McCauley<sup>1</sup>, Elisabeth Wilde<sup>1</sup>, Tricia Merkley<sup>2</sup>, Kathleen Schnelle<sup>1</sup>, Erin Bigler<sup>2</sup>, Ana Vasquez<sup>1</sup>, Jill Hunter<sup>1</sup>, Zili Chu<sup>1</sup>, Sandra Chapman<sup>3</sup>, Harvey Levin<sup>1</sup>

<sup>1</sup>Baylor College of Medicine, Houston, Texas, <sup>2</sup>Brigham Young University, Provo, Utah, <sup>3</sup>University of Texas–Dallas

## Objectives

Prospective memory (PM) is the formation of an intention and remembering to perform it in the future. Although deficits in PM functioning are known in children with traumatic brain injury (TBI), there are very few studies investigating remediation of event-based PM (EB-PM) impairments in the children. Similarly, no previous study has investigated the relation between EB-PM performance and volumetric brain imaging in children with TBI.

## Method

To address this issue, this study investigated EB-PM in children (7–17 years) with moderate to severe TBI ( $n = 40$ ) compared with children with orthopedic injuries (OI;  $n = 41$ ). As part of a prospective longitudinal study of children and adolescents, participants performed a naturalistic EB-PM task and underwent magnetic resonance imaging at 3 months postinjury. Data were analyzed using FreeSurfer software tools. Frontal and temporal regions correlating significantly with EB-PM performance were then analyzed for differences in tissue volume after adjusting for age at testing.

## Results

Compared with children with OI, children with TBI demonstrated significantly reduced gray matter volumes in the left dorsolateral prefrontal, orbitofrontal, and cingulate cortex, and a trend was found for the total temporal lobe. Right dorsolateral prefrontal and superior frontal cortex gray matter volumes were significantly reduced in the TBI group. White matter volumes were significantly lower in the right superior frontal and total temporal regions. These areas are generally consistent with findings from other studies of PM using functional imaging modalities identifying specific frontal and temporal areas as important in EB-PM performance.

## 0044

### MR Volumetry in Blast-Injury Traumatic Brain Injury

Kathleen Schnelle<sup>1</sup>, Elisabeth Wilde<sup>1</sup>, Maya Troyanskaya<sup>1</sup>, Tricia Merkley<sup>2</sup>, Randall Scheibel<sup>1</sup>, Mary Newsome<sup>1</sup>, Erin Bigler<sup>2</sup>, Zili Chu<sup>1</sup>, Xiaoqi Li<sup>1</sup>, Harvey Levin<sup>1</sup>

<sup>1</sup>Baylor College of Medicine, Houston, Texas, <sup>2</sup>Brigham Young University, Provo, Utah

## Objectives

Traumatic brain injury (TBI) is a leading cause of morbidity and disability in service members deployed in Iraq and Afghanistan. In postdeployment questionnaires, 12% to 15% of veterans reported sustaining a TBI and blast-induced neurotrauma accounted for 79% of these injuries. Blast-related TBI is associated with persistent cognitive and behavioral sequelae. The purpose of this study was to investigate changes in brain regional volumes of gray matter (GM) and white matter (WM) on magnetic resonance imaging (MRI), specifically frontal and temporal regions, following blast TBI. We also examined the relationship between brain region volumes and neurobehavioral measures.

## Method

We collected volumetric data on 7 patients with mild to moderate blast TBI (mean age = 30.39 years, SD = 6.20; mean interval since injury = 28.04 months, SD = 16.45). The comparison group consisted of 5 patients (mean age = 30.66 years, SD = 3.58). All patients were veterans who served in either Operation Iraqi Freedom or Operation Enduring Freedom. Subjects underwent MRI without sedation on Philips Achieva 3T scanners. Volumetric analysis was performed using the FreeSurfer image analysis suite. All patients were also given a neurobehavioral assessment.

## Results

The TBI group had significantly smaller parenchymal volumes than the control group in the total left hemisphere ( $P = .030$ ), cingulate ( $P = .022$ ), total frontal ( $P = .032$ ), dorsolateral prefrontal ( $P = .024$ ), and right amygdala ( $P = .026$ ) GM, and right dorsolateral frontal ( $P = .037$ ) WM. Total frontal (GM and WM) and dorsolateral prefrontal (GM and WM) volumes were correlated with Verbal Selective Reminding Test Consistent Long-Term Retrieval such that better performance was associated with greater volume. Global Severity Index from the Brief Symptom Inventory was correlated with orbital frontal GM and WM, total frontal WM, and cingulate WM,

such that decreased volumes were related to higher symptom report.

## 0045

### Accommodating Students With Brain Injuries in Online Higher Education Programs

Janis Ruoff, Monija Amani

*George Washington University, Washington, DC*

#### Objectives

Participants will be able to discuss (*a*) reasons why individuals with brain injuries may be especially interested in online higher education programs; (*b*) ways in which students with brain injuries may face special challenges in a college or university setting for participation in online programs and obtaining supports from an Institution of Higher Education office of disability support services; (*c*) strategies for retention and advising of students with brain injuries; and (*d*) the need for developing a disability-friendly model for online student support and instruction

#### Method

Returning veterans and other students with disabilities seeking higher education may be increasingly interested in online learning programs because they offer a self-paced learning environment with less need for transportation and relocation than a face-to-face program. Results of a survey of the GWU Center for Education and Human Services in Acquired Brain Injury (CEHSABI) conducted a part of the program evaluation for an online graduate certificate program in brain injury will be presented. Strategies for success and recommendations to the field for research and practice will be discussed.

#### Results

Preliminary findings indicate that students with brain injuries, in an online graduate professional preparation program, face unique challenges compared with their nondisabled peers, but with appropriate accommodations they can be successful. Also, students with brain injuries find that online learning offers a more structured and manageable environment. Institutions of higher education may be interested in providing increased online learning programs to increase enrollment and diversity of the student body, and to reach out to populations that the face-to-face program may not be able to attract. New approaches to support for online students with brain injuries are needed.

## 0046

### Trends in Survival and Early Functional Outcomes at Hospital Discharge Associated With Severe Adult Traumatic Brain Injuries: An analysis of the Pennsylvania Trauma Outcome Study Database, 1998–2007

Alvaro Sanchez, Robert Krafty, Harold Weiss, JuanCarlos Puyana

*University of Pittsburgh, Pittsburgh, Pennsylvania*

#### Objectives

Most contemporary reports indicate that the incidence rate of severe traumatic brain injury (TBI)-related hospitalization has been increasing over time. Yet, few registry-based, statewide, or national estimates have reported related trends in severe TBI-related disabilities. We aimed to determine if severe TBI-related survival and early functional outcomes at hospital discharge in adults have changed significantly over time, using the Pennsylvania Trauma Outcome Study Database from 1998 to 2007.

#### Method

TBI patients older than 17 years admitted to accredited trauma centers in Pennsylvania, between 1998 and 2007, were selected. Head-Neck Abbreviated Injury Scale > 3 was used to classify TBI as severe. Discharge status (death or alive) was assessed using logistic regressions to evaluate any significant variation over time. Functional independence measures at hospital discharge in patients who were discharged alive for 5 domains—feeding, locomotion, expression, transfer mobility, and social interaction—were assessed using multinomial regressions to evaluate any significant variation over time. Functional independence measures in each domain were scored from 1 (Complete Dependence) to 4 (Complete Independence).

#### Results

At hospital discharge, survival increased from 72.5% in 1998 to 82.7% in 2007 (coefficient .045, 95% CI = 0.029–0.061), after controlling for age, sex, comorbidities, injury type, injury intent, injury severity scores, other injuries, drug abuse, level of trauma center, and hospital stay. The proportion of survivors completely independent increased from 41.3% in 1998 to 47.2% in 2007 for Feeding ( $\beta = .073$ , 95% CI = 0.055–0.091), from 26.9% to 28.2% for locomotion ( $\beta = .065$ , 95% CI = 0.047–0.083), from 44.3% to 50.3% for expression ( $\beta = .098$ , 95% CI = 0.079–0.118), from 28.9% to 30.8% for transfer mobility ( $\beta = .065$ , 95% CI = 0.046–0.083), and from 43.2% to 50% for social interaction ( $\beta = .11$ , 95% CI = 0.096–0.135).

## 0047

### Identifying the Lifetime Traumatic Brain Injury History of Individuals in a General Population Survey

Gale Whiteneck, C.A. Brooks, Charlotte Dragon

*Craig Hospital, Englewood, Colorado*

#### Objectives

As part of a larger investigation to determine rates of long-term disability following traumatic brain injury (TBI) of various severities treated in various settings, a telephone interview procedure was needed to identify the lifetime history of TBI in individuals. The purpose of this research presentation is to describe the development, implementation, and early evaluation of the general population survey procedure to elicit information about an individual's history of traumatic injury from all etiologies and considerable detail about TBI occurrences.

#### Method

Over 100 questions are imbedded in a complex branching structure designed to efficiently collect maximum information

in minimal time. The interview begins by using a series of etiology prompts to help the respondent recall the traumatic injuries occurring during their lifetime. Questioning then focuses on injuries to the head and neck and data are gathered about injuries involving loss or alteration of consciousness, including TBI severity indicators; whether treatment involved hospitalization, being seen in an emergency department and released, care provided in a clinic or physician's office, or no treatment sought; and age at or years since injury.

### Results

To date 1176 members of the Colorado general population have been interviewed in a random-digit-dialed survey. The procedure has classified 24.6% of respondents as not reporting any traumatic injury in their lifetime; 35.7% have reported traumatic injury without any TBI, and 39.7% have reported 1 or more mild to severe TBIs in their lifetime. This computer-assisted telephone interview procedure has taken an average of only 2 minutes for those reporting no traumatic injuries; 5 minutes for those reporting traumatic injuries, but no TBI; and an average of 6 minutes for those reporting TBI. Implications of findings will be discussed.

## 0048

### Predicting Behavioral Versus Cognitive Executive Dysfunction in Pediatric TBI

Alice Ann Spurgin, BA, Oscar Benitez, BS, Ana Hernandez, MS, Katrina van de Bruinhorst, MA, Peter Stavinoha, PhD, Steven Kernie, MD

*Children's Medical Center Dallas, Dallas, Texas*

### Objectives

Children with traumatic brain injuries often spend several days in an intensive care unit (ICU), where their injuries are assessed and treatment is planned. Treatment planning (and thus prognosis) could be improved with a better understanding of what types of dysfunction are more likely in TBI patients who remain in the ICU longer. Minimal research has addressed this issue, particularly in a pediatric population. This study aimed to identify whether length of time spent in the ICU differentially predicts behavioral or cognitive executive dysfunction in children with TBI.

### Method

The Behavior Rating Inventory of Executive Function™ (BRIEF™) was administered to the parents of 19 children who sustained a mild to severe closed-head injury. The children, between 2 and 14 years old, were evaluated 3 to 12 months post-TBI. The sample was mostly male (68.4%) and Caucasian (63.2%). Correlations were run to determine significant variables, identified as inhibition, working memory, planning/organizing, and global executive component. Linear regressions were then conducted to evaluate whether days spent in ICU differentially predicted behavioral dysfunction (defined as impaired inhibition) or cognitive executive dysfunction (defined as impaired working memory and planning/organization).

### Results

Time spent in the ICU significantly predicted the patient's ability to control impulses ( $b = .588, P = .010$ ), accounting for 34.5% of the variance. It also predicted cognitive executive dysfunction, accounting for 31.7% of the variance in working memory ( $b = .563, P = .015$ ) and 25.7% of the variance in the ability to anticipate future events ( $b = .507, P = .032$ ). Length of time spent in the ICU may be more predictive of cognitive executive dysfunction than behavioral dysfunction within pediatric TBI populations; however, future samples should strive for larger, more heterogeneous samples.

## 0049

### Addressing the Needs of Homeless People With Brain Injuries in the District of Columbia

Sherry Billings<sup>1</sup>, Janis Ruoff<sup>2</sup>

<sup>1</sup>District of Columbia Department of Health, Washington, DC, <sup>2</sup>George Washington University, Washington, DC

### Objectives

To describe:

1. The District of Columbia Traumatic Brain Injury (TBI) Implementation Project, funded by the US Health Resources Services Administration
2. What the research says about the association between homelessness and TBI
3. The prevalence of homeless veterans in the District of Columbia and some of the challenges they face
4. Plans of the District of Columbia to better serve people who are homeless with brain injuries and to prevent secondary health problems and disability for this group.

### Method

The District of Columbia Traumatic Brain Injury (TBI) Implementation Project, funded by the US Health Resources Services Administration, aims to assess challenges faced by homeless people with TBI. During the first year (2008), the project reestablished a TBI Advisory Committee and developed a survey design and instrument. During the second year (2009), the project investigated the needs and resources of homeless people who have a TBI in the District. During year 3 (2010), information from the survey will be used to guide decisions about improvements in services for homeless people in the District.

### Results

Recent research has identified a high prevalence of brain injury among homeless people. According to Common Ground ([www.commonground.org](http://www.commonground.org)), an organization to end homelessness, "researchers say a blow to the head years earlier may be linked to problems later in life, such as learning disabilities, homelessness and alcoholism." A forgotten TBI may be the unrecognized source of "seemingly unrelated social problems." This investigation by the DC Department of Health provides information about these problems for some of the DC homeless people who report having had a TBI and ways in which the District plans to improve services and supports for them.

**0050****The Other 20%: Gender Differences in TBI—Generalizing From Research on Women with Disability**Margaret Nosek<sup>1</sup>, Elisabeth Sherwin<sup>2</sup>, Lynne Cole Davis<sup>3</sup><sup>1</sup>*Center for Research on Women with Disabilities, Department of Physical Medicine and Rehabilitation Baylor College of Medicine, Houston, Texas,*<sup>2</sup>*Department of Psychology, University of Arkansas at Little Rock, Little Rock,* <sup>3</sup>*TIRR Memorial Hermann Brain Injury Research Center, Physical Medicine & Rehabilitation Baylor College of Medicine, Houston, Texas***Objectives**

The purpose of this presentation is to

1. summarize issues associated with gender-based disparity in research on disability in general;
2. extrapolate from factors associated with gender-based disparity in disability research to the variables influencing it among individuals coping with TBI;
3. identify issues already identified among women with disabilities; and
4. differentiate between issues of concern to women with physical disabilities and those with TBI.

**Method**

The National Study of Women with Physical Disabilities and the Center for Research on Women with Disabilities conducted interviews with 31 women with a variety of physical disabilities and surveyed 950 women nationally (506 with physical disabilities and 444 women without disabilities). Results were summarized in a white paper. Findings were related to self-esteem, relationships, sexual functioning, abuse, and access to general and reproductive healthcare. The interaction of physical and cognitive impairment typical of TBI presents unique, gender-based, considerations for recovery, rehabilitation, social integration, and achieving and maintaining optimal states of wellness. The literature is essentially silent on these issues.

**Results**

Results are presented in the context for a research agenda addressing

1. provider education and training,
2. health promotion intervention research,
3. access to healthcare, and
4. secondary conditions.

**0051****Gender Differences in Adjustment to TBI: What Do We Already Know?**Lynne Cole Davis<sup>1</sup>, Margaret Nosek<sup>2</sup>, Elisabeth Sherwin<sup>3</sup><sup>1</sup>*TIRR Memorial Hermann Brain Injury Research Center, Physical Medicine & Rehabilitation Baylor College of Medicine, Houston, Texas,*<sup>2</sup>*Center for Research on Women with Disabilities, Department of Physical Medicine and Rehabilitation Baylor College of Medicine, Houston, Texas,*<sup>3</sup>*Department of Psychology, University of Arkansas at Little Rock, Little Rock***Objectives**

The purpose of this presentation is to

1. identify psychosocial problems already recognized among women with TBI,
2. cite the constraints of existing research, and
3. identify directions for future research.

**Method**

The extant literature suggests that psychosocial issues challenge women with TBI. Among the most prominent of these are role changes and associated relationship issues and intimacy problems. Additionally, consistent with the broader literature on women with disabilities, women with TBI are believed to be at increased risk for abuse relative to women without disability. The differential effects of TBI on men and women remain poorly specified because of conflicting findings, methodological inconsistencies, sample size limitations, and lack of gender-sensitive outcome measures.

**Results**

Results are presented in the context for a research agenda addressing

1. provider education and training,
2. measurement and research methodology, and
3. psychosocial health.

**0052****Establishing a Special Interest Group and the Research Agenda to Identify Gender Differences in Adjustment to Traumatic Brain Injury**Elisabeth Sherwin<sup>1</sup>, Lynne Cole Davis<sup>2</sup>, Margaret Nosek<sup>3</sup><sup>1</sup>*Department of Psychology, University of Arkansas at Little Rock, Little Rock,* <sup>2</sup>*TIRR Memorial Hermann Brain Injury Research Center, Physical Medicine & Rehabilitation Baylor College of Medicine, Houston, Texas,*<sup>3</sup>*Center for Research on Women with Disabilities, Department of Physical Medicine and Rehabilitation Baylor College of Medicine, Houston, Texas***Objectives**

The purpose of this presentation is to

1. extrapolate from factors associated with gender-based disparity in disability research to the variables influencing it among individuals coping with TBI,
2. discuss possible courses of actions to address the described paucity of literature,
3. enlist in the Special Interest Group focused on developing a research agenda and promoting the cause of women with TBI, and
4. volunteer for research projects whether through support (knowledge or resources) or by undertaking a research project.

**Method**

This is part 3 of the 3-part panel. Arising from the National Study of Women with Physical Disabilities, the Center for Research on Women with Disabilities issued a summary report "Improving the Health and Wellness of Women with Disabilities: A Symposium to Establish a Research Agenda." Overarching recommendations focused on provider education and training, measurement, health communication, barrier removal, health promotion intervention research, policy

issues, and cost-effectiveness and evaluation. Integrating the previous panel presentations, and derived from the recommendations made in the symposium report, this presentation will outline the concomitant research questions to be pursued.

### Results

Results are presented in the context for a research agenda addressing the following:

1. Establish a special interest group that will meet to promote agenda.
2. Prioritize research agenda for SIG.
3. Identify individuals interested in adopting areas of investigation.
4. Establish available resources and possible timeline for research.

## 0053

### Changes in the Cingulate in Acute Mild TBI Detectable With Diffusion Tensor Imaging and Their Relation to Memory Function

Trevor Wu<sup>1</sup>, Elisabeth A. Wilde<sup>3</sup>, Ragini Yallampalli<sup>3</sup>, Erin D Bigler<sup>1</sup>, Stephen R. McCauley<sup>3</sup>, Maya Troyanskaya<sup>3</sup>, Zili Chu<sup>3</sup>, Xiaoqi Li<sup>3</sup>, Tricia Merkley<sup>1</sup>, Jill Hunter<sup>4</sup>, Harvey Levin<sup>3</sup>

<sup>1</sup>Brigham Young University, Provo, Utah, <sup>2</sup>University of Utah, Salt Lake City, Utah, <sup>3</sup>Baylor College of Medicine, Houston, Texas, <sup>4</sup>Texas Children's Hospital, Houston

### Objectives

Individuals with mild traumatic brain injury (mTBI) often report memory disturbances, particularly in the first week postinjury. Functional imaging studies have demonstrated the association between the cingulum fibers and memory integrity. The cingulum bundles are a major white matter pathway connecting the parahippocampal gyrus and frontal lobe. Recent studies have found the selective vulnerability of the cingulum fibers to mTBI. Diffusion tensor imaging (DTI) has enabled us to assess and quantify the microstructural alterations following traumatic brain injury in vivo. This pilot study examined the relations between cingulum fibers and memory function in the acute stage following mTBI.

### Method

Twelve (6 males and 6 females) right-handed mTBI adolescents and young adults (mean age = 15.25 years) with mTBI (GCS score = 15; no abnormalities on CT) and 11 (6 males and 5 females) orthopedically injured (OI) adolescents were recruited. The demographic features (age and years of education) did not differ significantly. All patients were administered the Verbal Selective Reminding Test, a measure of verbal memory, and underwent DTI on Philips 3T scanners within 6 days postinjury. The 3 major DTI matrices, fractional anisotropy (FA), apparent diffusion coefficient (ADC), and radial diffusivity (RD), were analyzed by quantitative tractography using the Philips fiber tracking software.

### Results

The mTBI group had significantly lower ADC and RD in the cingulate in both right and left hemispheres than the OI group (all  $P$ 's < .005). The group difference for FA was marginally significant ( $P = .11$ , Cohen's  $d = 0.66$ ) with higher FA for the mTBI group. This is consistent with previous reports of increased FA and decreased ADC/RD in the acute phase of injury that has been attributed to subtle cytotoxic edema. Additionally, FA of the left cingulum bundle was negatively correlated with the 30-minute delayed recall (VSRT) ( $r = 0.56$ ,  $P = .05$ ), where higher FA was associated with poorer performance on the memory task.

## 0054

### Tax Efficient TBI Awards—Considerations for Keeping the Award Income and Estate Tax Efficient

Lisa Ayn Padilla

*New York Law School, LLM Program in Taxation, New York*

### Objectives

Personal injury awards are income tax free. However, the growth on the proceeds is subject to income tax, and there are occasions where the person with brain injury does not survive to receive the entire TBI award that may then result in an estate tax on the portion of the award not received and/or not used. This seminar will provide the patient's advocates with a basic understanding of the income taxation of trusts and estate taxes and will illustrate methods that protect personal injury awards, initially income tax free, from additional taxation.

### Method

Identification and description of vocabulary required to negotiate more tax efficient TBI settlements for those representing people with brain injuries. Identification and description of tax-efficient options for families to consider when implementing a care management plan. Identification and description of additional tax-efficient tools for financial advisors to help patients and their families shape their financial plans.

### Results

Participants will enhance their understanding of (a) basic income and estate tax principles, (b) "typical" settlement structures that can be more tax efficient, and (c) strategies for making TBI awards more tax efficient.

## 0055

### Personal Support Services for People With Acquired Brain Injuries

Virginia Martin, Laura Vazquez

*Shepherd Center, Marcus Community Bridge Program, Atlanta, Georgia*

### Objectives

The primary objective of the Personal Support Services Pilot Project was to measure the effectiveness of life skills training

with people with acquired brain injuries in their homes and communities after they have been discharged from postacute rehabilitation. The goals were for them to become more independent, take greater responsibility over their daily life skills, and require less supervision.

### Method

Goal areas addressed included time management, morning routine, medication management, home cleaning, laundry, grocery shopping, meal and snack preparation, postmeal cleanup, pet care, home safety, consumer transactions, bill payment, budgeting, and checkbook management.

Each client was consistently seen by 1 of 3 Life Skills Trainers who was a therapeutic recreation specialist with project specific training. During an initial session, the clients identified goals on which they wanted to focus using the Canadian Occupational Performance Measure. They were seen once weekly for 1 to 4 hours to address identified goals. The trainer taught the task and worked with the client to practice the skill and to develop the structure and compensatory strategies needed for success. The family was also trained in providing the structure and cueing the client needs to successfully complete tasks.

### Results

Seventeen clients completed the project. Primary outcomes were assessed by comparing the change from baseline to program completion. The majority of clients (88%) required less supervision as measured by the Supervision Rating Scale. For 71% of clients, a clinically significant change was observed that potentially allows family members to return to work (change from supervision during most waking hours to part-time waking hours). Clients demonstrated significant improvement in Canadian Occupational Performance Measure self-ratings of performance and satisfaction as well as improvement on a 7-point task specific scale.

## 0056

### Semantic and Syntactic Development in Preschool Children

Leda Zecevic-Filipovic<sup>1</sup>, Slavica Golubovic<sup>2</sup>

<sup>1</sup>Kindergarden, Tivat, Montenegro, <sup>2</sup>Faculty of Special Education and Rehabilitation, University of Belgrade, Belgrade, Serbia

### Objectives

When analyzing languages, an analysis can be said to cover both the "syntax and semantics" concerning both the format and meanings of phrases in a language. Semantics is the sub-field that is devoted to the study of meaning, as borne on the syntactic levels of words, phrases, sentences, and even larger units of discourse. Semantics involves the interplay of concrete data with theoretical concepts. Semantics has included the study of connotative sense and denotative reference, truth conditions, argument structure, thematic roles, discourse analysis, and the linkage of all of these to syntax.

### Method

The sample of examinees includes 22 girls, aged 6 to 6.2 years. All of there are tested with Reynell scale of language development, which is standardized by Croatia and Serbian language.

### Results

Results of examined sample of girls show relatively small difference between examinees who are of the same calendar age (6 years) on tasks of Understanding Scale and Speech Production Scale, in other words, 0.2 SD of AS, or till 1/2 calendar year, or adequate semantic development and inadequate syntactic development. Only 1 girl demonstrated significantly better syntactic than semantic level on all tasks of speech production scale: vocabulary, content and structure, or speech understanding responses to age of 3.5 SD, and syntactic level is 1 year above expected 3.6 SD. Results of speech understanding showed that she deviated from expected for 1.8 year, or, in other words, 1.9 SD, and speech production is in accordance to syntactic abilities of child with respective dysphasic disorder.