NEW JERSEY COMMISSION ON
BRAIN INJURY
RESEARCH

**DIRECTORY OF GRANT AWARDS
2015 GRANT CYCLE**

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MAY 2015

NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH

This data was compiled in compliance with the New Jersey Commission on Brain Injury Research's statutory mandate, N.J.S.A. 52:9EE-1" …to compile a directory of brain injury research being conducted in the State."

The information contained within this directory is not all-inclusive. The research projects and researchers listed in this directory are all based in the State of New Jersey and have applied to and received funding during the fiscal year 2015 grant cycle. The research projects are not categorized, or listed in any particular order.

This directory is not a complete listing of all scientific research being performed within the State of New Jersey due to the proprietary nature of the research being conducted at various institutions throughout the State. In addition, institutions are not obligated to share their research information with the New Jersey Commission on Brain Injury Research.

Please feel free to contact the New Jersey Commission on Brain Injury Research at P.O. Box 360, 369 S. Warren Street, Trenton, New Jersey, 08625. The Commission's office can be reached by telephone at 609-633-6465, by fax at 609-943-4213, or by e-mail at NJCBIR@doh.state.nj.us.

For information on the New Jersey Commission on Brain Injury Research's grant award process, grant applications and deadlines, please see: www.state.nj.us/health/njcbir.

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NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH

GRANT AWARDS

INDIVIDUAL RESEARCH GRANT RECIPIENTS:

Mesut Sahin, Ph.D.
New Jersey Institute of Technology
Grant Award: $347,617

Project Title: ***Electrophysiological Assessment of Traumatic Cerebellar Injury***

The main objective of the project is to understand the mechanism of traumatic injuries to the cerebellum using the electrophysiological method.

Devastating consequences of severe head injuries are well known to the American public. Scientific evidence is building up to suggest that mild head injuries, which sometimes are called concussions, can leave permanent damage in the brain especially if they reoccur before the person completely recovers from the first injury. These mild injuries are difficult to study in experimental animals because the damage may not cause the brain cells to die, but rather slow down their communication with other cells. Classical methods of studying neural damage (e.g. histology or neural imaging) are not suitable to assess the severity of such mild injuries. These types of injuries cannot be detected using behavioral measures since the impairments may be too subtle to be observed in the motor function or cognition.

Our objective is to develop a highly sensitive technique that relies on monitoring of the electrical activity from the injured brain that will correlate with the severity of injury in a reliable and reproducible manner. Developing the technique for clinical diagnostics in human patients will be the future goal.

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Jean Lengenfelder, Ph.D.
Kessler Foundation
Grant Award: $506,322

Project Title: ***Treating Emotional Processing Impairments in Individuals with TBI:
                    A Randomized Controlled Trial***

This proposal will investigate a treatment for emotional processing deficits in TBI evaluating psychological, neuropsychological, functional abilities as well neural changes pre and post-treatment.

Individuals with Traumatic Brain Injury (TBI) experience a number of symptoms which are both physical and cognitive. Recent evidence suggests that a significant number of individuals with TBI have difficulty in emotional processing. Specifically, some individuals with TBI have difficulty correctly identifying emotions from facial expressions. Deficits in emotional processing can have a significantly negative impact on social interactions, mood, and quality of life. Therefore, treatment of emotional processing deficits is critical to improving the lives of individuals with TBI.

The current study examines a treatment for emotional processing deficits in TBI. Using an intervention that has been successful in autism and schizophrenia, the proposed study will examine the effects of an emotional processing training program in persons with TBI. The study will examine not only the effects of the intervention on emotional processing abilities, but also on psychological, neuropsychological, and functional abilities as well as neural changes using neuroimaging.

It is hypothesized that improved emotional functioning, as well as improvements in cognitive abilities, mood and quality of life will be observed following the emotional processing intervention. The current study will also use neuroimaging to examine changes in the brain that occur following an emotional processing training program.

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Jorge Contreras, Ph.D.
Rutgers, Biomedical & Health Sciences
Grant Award: $540,000

<u>Project Title</u>: ***Pannexin Hemichannels as a Therapeutic Target for Traumatic Brain Injury***

Understanding of pannexin protein function in traumatic brain injury will contribute to the development of pharmacological strategies that improve patient outcomes after brain injury.

Approximately 1.7 million people sustain a Traumatic Brain Injury (TBI) annually in the United States. It has long lasting consequences on cognitive ability, due to neuronal loss. Mechanical trauma produces a primary injury to neurons, glia and blood vessels that is followed by a delayed secondary injury, which may persist from days to years. Cellular death occurs within minutes to hours after TBI and the peri-contusional brain edema that follows TBI enhances the acute necrosis. This acutely produced cell death releases pro-inflammatory molecules including adenosine triphosphate (ATP) that initiates post-traumatic inflammatory responses. If exacerbated, this inflammatory response promotes injury progression worsening the outcome following TBI.

Recently, pannexin proteins have shown to be a channel pathway for ATP release from dying cells enhancing the inflammatory response in several injury models. Yet, the contribution of pannexin channels in neuroinflammation following TBI is not fully understood.

In this proposal we plan to test the role of pannexin in TBI using a mice model of controlled cortical impact, and hopefully, demonstrate that an increase in the activity of pannexin channels enhances neuroinflammation and neurodegeneration following brain injury. We expect to find that administration of pannexin channels blockers may be useful as therapeutic drugs to improve neurological outcomes following TBI. We hope that the pannexin blockers attenuate neurodegeneration and behavioral deficit after injury. This knowledge may lead to initiation of new pharmacological strategies that target pannexin to treat human pathologies followed by TBI.

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Gleb Shumyatsky, Ph.D.
Rutgers, Department of Genetics
Grant Award: $535,000

Project Title: ***The Role of Stathmin and Microtubule Stability in Vulnerability, Development and Recovery from mTBI and Accompanying PTSD***

We will examine for the first time a transgenic mouse, as a preclinical model for blast related traumatic brain injury, a signature injury associated with depression and PTSD in war veterans.

Blast related traumatic brain injury (TBI) has been a major cause of injury in Iraq and Afghanistan. Importantly, mild TBI (mTBI) has been often associated with post-traumatic stress disorder (PTSD). Because of the overlapping features of mTBI and PTSD, it has been difficult to understand the differences between the two disorders, or understand how they are linked. Thus, a preclinical model is needed to enable the characterization of unique and overlapping features and the connection between these two disorders. A preclinical model would allow for better understanding of these disorders from the anatomic, cellular and molecular perspectives.

Recently, a protein called stathmin was found to be induced in a rat model of repetitive blast-injury caused mTBI. which also leads to a variety of PTSD-related behavioral abnormalities. This finding is intriguing, because the work from our lab, as well as others, has implicated stathmin in cognition, fear and anxiety in rodents and humans. Our more recent work, where we describe a mechanism by which stathmin is directly involved in fear memory by regulating cellular cytoskeleton, will be the basis for this grant proposal. Also, our pilot data show that stathmin transgenic mice display deficits consistent with symptoms of depression. These findings are important because depression and PTSD are the most common psychiatric consequences associated with traumatic injury.

Based on these findings, we will test the hypothesis that improper stathmin function predisposes an organism to mTBI-induced PTSD symptoms. Our Specific Aims will examine this hypothesis at the transgenic, behavioral, anatomic and molecular-structural levels. Surprisingly, no transgenic models have been tested in relationship to mTBI-induced PTSD symptoms. Thus, our work is important as it will probe stathmin and its associated molecular network, using the transgenic approach for the first time in research on mTBI-induced mental disorders.

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Sridhar Kannurpatti, Ph.D.
Rutgers, Biomedical & Health Sciences
Grant Award: $514,057

Project Title: ***Mitochondrial Facilitation Treatment in Mild Traumatic Brain Injury and its Integrated Translatable Monitoring***

The proposed studies will evaluate neuronal circuit reorganization after a mild brain injury and mitochondrial facilitation treatment in a manner similar to that performed on brain injured humans.

Brain injured humans are clinically monitored using radiological imaging followed by neurophysiological and behavioral testing during rehabilitation. If therapeutic agents directed against brain injury outcomes advance to preclinical phase, the therapy's efficacy has to be evaluated in a preclinical animal model. Furthermore, it is best if the animal model brain functional outcomes are measured in a similar manner as performed on brain injured humans.

Towards this goal, we pioneered the application of functional imaging (optical and magnetic resonance imaging) to map brain functional reorganization after a mild brain injury in a rat model. This pilot study funded by the New Jersey Commission for Brain Injury Research observed neuronal damage in the injured area in addition to deficiencies in the neuronal functional circuits and blood flow in adjoining regions away from the site of injury. We also discovered that facilitating mitochondrial function improved the brain injury outcome. In order to distinguish the impact of mitochondrial facilitation treatment on the neuronal and vascular (blood flow) compartments, we will image brain function and its electrical activity in brain injured rats with and without treatment. Behavioral testing of sensorimotor abilities will be obtained along with postmortem histology of neuronal survival in the brain. The imaging and electrical measures obtained in the proposed studies are similar to those currently measured in humans sustaining brain injuries.

The proposed strategy will not only lead to a new method for monitoring brain injuries, but also speed up the pipeline with the development of new medicines to treat brain injured patients. The current studies will spawn new strategies to develop better medicines and also monitor their effectiveness for the approximately 175,000 New Jersey residents who have suffered brain injuries, and future brain injury patients increasing at a rate of 15,000 per year within the state.

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Vineet Chitravanshi, Ph.D.
Rutgers, Biomedical and Health Sciences
Grant Award: $540,000

Project Title: *Traumatic Brain Injury: Functional Alterations in the Brain Cardiovascular Regulatory Areas*

In this proposal the mechanisms of cardiovascular complications accompanying traumatic brain injury and their prevention or attenuation by selected pharmacological agents will be studied.

Traumatic brain injury (TBI) is an enormous medical problem nationwide, as well as in the State of New Jersey. There is an urgent need for understanding the mechanisms of alterations of brain functions in patients with TBI so that new and effective treatments can be developed for these injuries.

Cardiovascular complications often accompany TBI. The goal of this proposal is to understand the mechanisms of these complications and test pharmacological treatments that have a potential to prevent secondary brain damage and improve the outcome of these injuries.

In this proposal, techniques that are well established in this laboratory will be used to study the mechanisms of functional alterations in the brain areas that are known to play a critical role in cardiovascular regulation. A well-established rat model, in which concussive brain injury is produced by application of a fluid pressure wave to the brain, will be used in this study. First, immediate and delayed changes in the blood pressure, heart rate and respiration produced by brain trauma will be studied. Next, the impairments in reflexes, that normally maintain cardiovascular function at optimum levels, will be studied. Finally, functional changes in the hind-brain areas that regulate cardiovascular functions will be studied.

In all experiments, pharmacological agents that have a potential to protect brain damage will be used to test if the impairments in cardiovascular functions can be prevented or attenuated. Three substances (C-type natriuretic peptide, muscimol and valproic acid) were selected because they showed some promise in preventing or attenuating undesirable cardiovascular complications of TBI in our preliminary studies. One of them, valproic acid, is used clinically to treat epilepsy. The results of the present study are likely to be helpful in understanding the mechanism of cardiovascular complications of TBI and provide a rational approach for developing new strategies to prevent them.

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Wilma Friedman, Ph.D.
Rutgers, Department Biological Sciences
Grant Award: $540,000

Project Title: ***Strategies for Neuroprotection from Seizures***

We will evaluate proNGF antagonists to assess their efficacy in preventing neuronal death from seizures, which are a common consequence of TBI.

One of the most common consequences of traumatic brain injury (TBI) is the development of posttraumatic epilepsy, leading to additional loss of neurons beyond the initial TBI damage, disrupting neuronal circuitry and compromising brain function yet further.

In previous work, we have characterized specific mechanisms that regulate the loss of neurons from seizures. In our current studies we have identified FDA-approved compounds that antagonize this mechanism of neuronal death, and we will investigate the efficacy of these compounds in preventing neuronal death from seizures. The ability to prevent further loss of neurons from posttraumatic epilepsy will be beneficial to prevent additional compromising of neural function for those who have already suffered neuronal loss from the initial injury.

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MULTI-INVESTIGATOR RESEARCH GRANT RECIPIENT:

Guang Yue, Ph.D.
Kessler Foundation
Grant Award: $1,918,684

Project Title: ***A Comprehensive Study of Balance Dysfunction, its Recovery Following Intervention and Underlying Neural Mechanisms in Traumatic Brain Injury***

This multi-investigator application will investigate intervention effect on posture stability, neural mechanisms of balance dysfunction and recovery in TBI, and neuroimaging–based biomarkers of Traumatic Brain Injury (TBI).

To successfully treat TBI disabilities, (1) Effective interventions are needed (treatment problem). (2) In addition, it is critical to understand neural mechanisms underlying the injury and its recovery, including location and severity of brain injury, and neuroplasticity that mediates disability and promotes recovery (mechanism problem). And (3) an objective and accurate diagnostic tool is vitally important for correct diagnosis of the injury, which is a prerequisite for targeted treatment (diagnostic problem).

As one might see, without solving the diagnostic and mechanism problems, the treatment problem cannot be adequately solved. In other words, if the injury cannot be accurately diagnosed and neurophysiological and neuromuscular contributions to the disability(s) are not understood, then the conditions cannot be treated effectively. Unfortunately, no objective diagnostic tools are available for accurate and objective detection of the injury, and very little is known regarding neural mechanisms mediating injury progression and function recovery; the diagnostic and mechanism problems limit chances of successful treatment.

Based on the above rationale, the major goals of this Multi-Investigator application are three folds: (1) develop a comprehensive computer algorithm for quick, automated, objective and accurate classification of brain injury in patients with mild, moderate and severe TBI diagnosed by clinical tools; (2) understand neurophysiological adaptations and neural plasticity in TBI and their relation with balance dysfunction and sensorimotor performance; and (3) evaluate the effect of a well thought-out intervention on remedying balance dysfunction in individuals with mild, moderate and severe TBI, and the effect of the intervention on changes in the brain and neuromuscular system and relation between the changes and sensorimotor and balance functions.

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FELLOWSHIP RESEARCH GRANT RECIPIENTS:

Cherylynn Marino
Kessler Foundation
Grant Award: $198,645

Project Title: ***Advances in Treatment: Examining the Influence of a Mindfulness Based Cognitive Therapy Program on Reducing Internalizing and Externalizing Problems Following Pediatric Traumatic Brain Injury***

This longitudinal study will examine the efficacy of a mindfulness based cognitive therapy program on improving psychosocial adaptation following a TBI. The purpose of this research is to investigate the influence a mindfulness based cognitive therapy (MBCT) intervention will have on internalizing and externalizing problems in children and adolescents that have suffered a Traumatic Brain Injury (TBI).

Internalizing problems refer to a set of symptoms in which a person over-controls their emotions and results in social withdrawal, feelings of worthlessness, depression, and anxiety. In contrast, externalizing problems refer to an under-control of emotions which results in conduct problems, impulsive behavior, and aggression. Social and emotional difficulties are prominent consequences of childhood TBI. Left untreated or undertreated, these problems often persist into adulthood, producing a wide range of challenges adapting in personal and vocational domains. At present, there are minimal non-pharmacological therapeutic approaches that effectively treat deficits unique to TBI. Developing innovative, evidence based methods is essential in helping children fully recover from the injury.

In detail, the MBCT intervention promotes self-regulation of emotions and behaviors within an accepting and non-judgmental therapeutic environment. During this interactive, multi-sensory program, participants will learn strategies to help manage their emotions and thoughts and help them to develop greater insight into the influence these experiences have on their behaviors. Participants will engage in brief at home exercises to enhance their learning of these new skills.

In this study, children and adolescents struggling with internalizing and/or externalizing problems following a TBI will be randomly assigned to either the MBCT treatment or a non-therapeutic arts and crafts group. To keep materials and content age appropriate, youth will attend a group within their age range (i.e., children: ages 9 to 12; adolescents: ages 13 to 17). The groups will meet twice a week for twelve weeks. Participants will be assessed after the treatment sessions and at three and six month points after the last session.

In summary, this study will test how well the intervention improves internalizing and externalizing problems in youth. The strategies taught in the program are coping skills that learners can use on their own to help them better manage negative emotions. A potential outcome of this study is to develop a new treatment that can be used to address these problems for children and adolescents following a TBI.

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Valentina Dal Pozzo
Rutgers, Cell Biology & Neuroscience
Grant Award: $100,500

Project Title: ***Role of Reelin in Traumatic Brain Injury***

The project is focused on understanding the function of the extracellular protein Reelin after traumatic brain injury, and determining if this can be beneficial for restoring cognitive function.

Traumatic brain injury (TBI) causes severe cognitive disability or death, resulting from common occurrences such as falls, car accidents, sport activities, or violence. Statistical data reported that in the United States 2 million people are affected by TBI annually, and approximately 15,000 people are New Jersey residents. Most of the time, the patients require long rehabilitative treatments at a high cost for the families and for the State of New Jersey. The injury results in various symptoms, such as seizure, cognitive disability, loss of memory, visual disturbances and other debilitating neurological problems. At the moment, there are limited treatments available and no effective cure for cognitive disability after TBI.

In our preliminary work, we observed a high expression of Reelin in the injury side of the brain in mice that had been subjected to TBI. In particular, Reelin was strongly induced in the hippocampus, an area of the brain that plays an important role in learning and memory. In vitro, we also observed that exogenous Reelin protects neuronal cells from the toxicity induced by high doses of glutamate, an excitatory amino acid that is known to increase rapidly in the extracellular space after brain injury. Based on these findings, we hypothesize that Reelin may be beneficial for recovery after TBI.

In this proposal, we will use in-vivo and in-vitro approaches to establish the role of Reelin as a potential factor that promotes recovery after brain tissue damage. In-vivo, we will use a TBI model in mice that mimics human brain injury, and will identify the types of cells in which Reelin expression is induced. We will perform behavioral studies in wild type and mutant mice deficient for Reelin signaling activity to determine whether Reelin is important for recovery. In-vitro, we will investigate the potential role of Reelin in neuroprotection after exposure to the chemical damage of glutamate.

Our overall goal is to firmly establish the role of Reelin in recovery after TBI. If our hypothesis is confirmed, Reelin signaling could be a new target for pharmacological treatments aimed at improving the quality of life of people affected by TBI.

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Akshata Korgaonkar
Rutgers Biomedical & Health Sciences
Grant Award: $100,500

Project Title: ***Differential Toll-like Receptor 4 Modulation of Hippocampal Plasticity in the Normal and Injured Brain***

Identify the differences in how the innate immune receptors TLR4 act in the normal and injured brain physiology.

Traumatic brain injury (TBI) is one of the major causes of post traumatic epilepsy. TBI triggers neuronal injury which results in early activation of immune responses and cellular and synaptic changes in the hippocampal dentate gyrus. Recently, it has been identified that a class of pattern recognition receptors of the innate immune system, toll-like receptor 4 (TLR4), which can be activated by molecules released from traumatized cells, can change hippocampal excitability after brain injury. Although pharmacologically inhibiting these receptors can reduce excitability after brain injury, our studies show that the same drug increases excitability in the uninjured brain. Thus, while blocking this receptor may be effective in preventing development of neurological disorders after injury, it may precipitate diseases in the normal brain.

This study aims to identify the differences between the way these innate immune receptors act in the normal brain and in the injured brain so that the appropriate pathways can be selectively targeted to prevent memory dysfunction and enhanced seizure risk following brain injury.

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Mihir Patel, Ph.D.
Rutgers, Cell Biology & Neuroscience
Grant Award: $100,500

Project Title: ***Recovery of the Dendritic Network after Traumatic Brain Injury***

This project will assess how normal dendrite branching and connectivity can be rescued after traumatic brain injury (TBI).

Traumatic brain injury (TBI) is caused by the rapid movement of the brain within the skull due to a traumatic event. TBI leads to damage of neurons in the area of impact in the brain. The death of a subset of neurons eventually leads to the death of neighboring neurons because survival of neurons depends on the signals they receive from other neurons through dendrites (neuronal processes). After injury, reestablishment of neuronal circuitry is required to rescue normal neuronal (i.e. cognitive) functions. Currently, no effective treatment is available to improve cognitive function after TBI.

We are studying neuronal cells to explore the detailed molecular mechanisms responsible for regulating neural circuitry. PSD-95 (postsynaptic density-95) is a molecular target involved in the regulation of the dendritic network. We will study the effect of altered PSD-95 expression on the dendritic network under conditions mimicking TBI. We predict that PSD-95 plays a role in repairing normal neural circuitry after injury by regulating dendrite branching and spine formation. The detailed study of this molecular target and mechanisms post-trauma will help to develop new drugs and treatments for functional recovery after TBI.

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Karla Frietze
Princeton University
Grant Award: $100,500

Project Title: ***Investigating the Role of MHCI in Excitotoxicity Following Traumatic Brain Injury***

Understanding how MHCI controls neuronal excitation following traumatic brain injury.

Traumatic brain injury (TBI) affects 1.4 million U.S. citizens each year. TBI causes two phases of brain injury: primary damage at the time of impact, and a prolonged phase of secondary damage. This secondary phase, which enlarges the area of the injury and worsens clinical outcomes, is driven by overstimulation of neurons around the injury site. Thus, even when the primary damage is done, it still may be possible to significantly reduce TBI-induced brain injury by preventing neuronal overstimulation.

We recently identified a family of proteins, called MHCI, that unexpectedly regulate the brain receptors that cause neuronal overstimulation and damage after TBI. Furthermore, the levels of these MHCI proteins rapidly and dramatically increase in the brain following TBI, suggesting they may play a key role in determining the extent of secondary damage that occurs. In order to develop therapies to exploit this natural control knob for secondary brain injury, we must first understand how, on a molecular level, MHCI regulates neuronal activation.

In the proposed research, I will use a powerful combination of electrophysiology, mass spectrometry, biochemistry, and molecular biology to identify the molecular binding partners through which MHCI controls neuronal excitation. By identifying these binding partners, and mapping the sites in MHCI where they bind, the proposed studies may lead to a new therapeutic approach to reduce the scope of the damage to the injured brain in the wake of TBI.

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PILOT RESEARCH GRANT RECIPIENTS:

James Sumowski, Ph.D.
Kessler Foundation
Grant Award: $175,623

<u>Project Title:</u> ***Randomized Controlled Trial of Retrieval Practice to Improve Academic Achievement after Pediatric Traumatic Brain Injury***

This pilot randomized controlled trial will investigate whether retrieval practice training (versus control) improves learning of academic material in adolescents with memory impairment after TBI.

Many children and adolescents suffer moderate-to-severe traumatic brain injuries (TBI), often leading to chronic learning and memory problems. Not surprisingly, learning and memory problems negatively affect academic achievement, thereby setting pediatric survivors of TBI on a negative trajectory toward lower educational attainment, limited employment options, and reduced overall quality of life.

Adolescents are charged with learning vast amounts of information across diverse topics in middle school and high school, which represents a challenge even for students without memory difficulties. It is therefore critical that we identify effective learning interventions for adolescents with TBI, to give these students their best opportunity to achieve in secondary school, and open doors to post-secondary education.

Herein we propose a pilot randomized controlled trial of retrieval practice training (RPT) versus a self-selected study (SSS) control to improve learning of academically-relevant information in adolescents with memory impairment after TBI. There is robust empirical support for retrieval practice as a learning and memory strategy among healthy college undergraduates, and we have extended these findings to memory-impaired neurologic populations, including pediatric TBI, in a series of well-controlled laboratory experiments. The time is ripe to translate these laboratory findings to a randomized controlled trial wherein adolescents learn to employ the retrieval practice strategy to learn academically-relevant material: foreign language vocabulary, geography, scientific diagrams, history, and literature.

Our findings will support RPT as an effective treatment for academic learning problems in adolescents with TBI. This strategy is simple enough to be easily employed in school and home settings, and will have positive effects on academic achievement in the short term, and higher educational attainment and employment outcomes in the longer term.

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Karen Nolan, Ph.D.
Kessler Foundation
Grant Award: $178,420

Project Title: ***Improving Mobility Utilizing Robotic Exoskeletons for Children with Traumatic Brain Injury***

Quantifying the clinical, biomechanical and functional effectiveness of a robotic exoskeleton early intervention gait therapy for adolescents during in-patient rehabilitation with acute TBI.

This study is relevant to the nearly 175,000 New Jersey residents currently living with disabilities from traumatic brain injuries (TBI), the majority of whom are children. Childhood TBI is a major public health concern and it is estimated that in the United States 511,257 TBI incidents occurred in children between 2002 and 2006. The two age groups at highest risk for TBI are 0 to 4 year olds and 15 to 19 year olds, and more than 20% of these patients have a moderate or severe TBI.

Mobility impairment is one of the most disabling aspects of adolescent TBI. If mobility deficits cannot be correctly detected and adequately treated, patients are expected to endure deceased functional ambulation, increased disability and deceased quality of life. This is a critical public health concern due to the 5.3 million TBI survivors dealing with the disabling effects of mobility impairment and decreased independent ambulation after TBI.

The current proposal emphasizes translational research and interventions that promote recovery of function after TBI. The outcomes of this pilot study will demonstrate the efficacy of robotic exoskeletons (RE) for early intervention gait therapy for in-patient adolescent rehabilitation. RE in-patient therapy will promote physiologic function, social participation and quality of life by facilitation recovery of motor function after TBI. This innovative pilot investigation will provide preliminary data for larger scale investigations with the potential to have a significant impact on the effectiveness of robotic neurorehabilitation for adolescents with TBI and the need for revolutionizing in-patient adolescent gait rehabilitation.

The selected outcomes of this pilot study will demonstrate the efficacy of RE early intervention gait therapy for in-patient adolescent rehabilitation to promote physiologic function, social participation and quality of life by promoting recovery of function after TBI.

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