

Relationship between substance use and the onset of Spinal Cord Injuries:
A medical chart review

Lori Ann Eldridge

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_____ Piatt, Jennifer, Ph.D.

_____ Ramos, William, Ph.D.

_____ Agle, Jonathan, Ph.D.

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Abstract:

Spinal cord injuries (SCI), although known to have a long-term impact on the individual who sustains the injury, can have a more debilitating impact on an individual with a co-occurring substance use disorder. In fact, previous research has identified substance use as a primary risk factor of sustaining a SCI. Although the majority of SCI and substance misuse disorder research typically focuses on treatment of individual post-injury. It is unclear what form of substance an individual engages in prior to sustaining the SCI (i.e., cannabis, opioids, alcohol). This study reviewed 20 medical charts of individuals ages 18 and older who have sustained a SCI and received medical care at a level 1 trauma center in Indiana, United States. Results showed that SCI were sustained from the following: 45% fall, violence 25%, vehicular 25%, and other 5%. Data revealed an 80% positive toxicology or self-report of substance use immediately prior to the onset of the SCI. Males were positive for (or reported uses of) more than one substance at a rate of 25% at time of injury. The following substances were identified as used prior to injury and listed as most to least prevalent: opioids (37.5%), alcohol & marijuana (25%), methamphetamines & benzodiazepines (12.5%), and cocaine and synthetic cathinone (6.25%). Additionally, the rate of unemployment prior to injury was 80% for the total population sampled and 81.25% for individuals with positive substance use reported immediately prior to injury.

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Background and Significance

Spinal cord injuries (SCI) result in a change to the spinal cords normal function (National Spinal Cord Injury Statistical Center, 2016). Symptoms of SCI are dependent on the severity and location of injury but can include complete or partial loss of motor function of the arms, legs, or entire body, complete or partial loss of sensory function, inability to regulate bowel or bladder control, and effects to heart rate, blood pressure, and breathing (World Health Organization, 2013). Approximately 17,000 SCIs occur annually in the United States. The leading causes of such injuries include vehicular accidents, violence (mainly gunshot wounds), falls, and sports-related incidents). The average lifetime medical cost for an individual living with paraplegia (injury age 25) is \$428,000, while the average lifetime medical cost for an individual living with quadriplegia (injury age 25) is \$1.35 million (National Spinal Cord Injury Statistical Center, 2016). Furthermore, the Christopher Reeve Foundation projected that the United States could save an estimated \$400 billion dollars by providing SCI-based preventive and therapeutic interventions (Bellon, et al 2013).

This permanent and often overwhelming disability can affect all eight dimensions of wellness, which public health officials and educators have identified as key factors in improving physical and mental well-being: emotional, environmental, financial, intellectual, occupational, physical, social, and spiritual (SAMHSA, 2017). For example, the stigma that occurs post-SCI can be emotionally devastating for the individual with an SCI. Individuals that are non-disabled may feel uncomfortable and avoid or shorten their interactions with individuals living with a SCI (Susman, 1994). One study exposed the emotional difficulties one faces post-injury regarding interacting with the public. Research participants stated that they sometimes felt like a nuisance,

and/or a burden resulting in exclusion and not belonging (Dickson, Ward, O'Brien, Allan, & O'Carroll, 2011).

Secondary health conditions can be complex for individuals with SCI and can be influenced by their personal, work, social, and overall physical environment. Barriers to health are common and affect the individual's current and future health, medical treatment, and overall quality of life (Cao, Walker, & Krause, 2015). An additional barrier to health is financial stability; this is directly influenced by SCI. Individuals are less likely to return to work post-injury and when they do return to work there is a decrease in earnings. Overall, the average loss of earnings per year for the typical person living with an SCI was \$12,000 - \$20,000 (Ma, Chan, Carruthers, 2014), regardless of income level prior to injury. This is then compounded by the medical expenses associated with the SCI and managing secondary health conditions.

Cognitive (intellectual) skills frequently are damaged post-SCI as well, and common neuropsychological deficits among these patients include poor concentration ability, impaired memory function, and altered problem-solving ability (Slater, 1997). The decrease in cognitive skills may be due to one or more of alcohol or substance abuse, motivation problems, and premorbid learning disability (Davidoff, Roth, & Richards, 1992). Decreases in cognitive skills can affect retention skills directly affecting the recovery process post SCI (Kantak & Winstein, 2012).

The primary impetus for this study, though, is the fact that chronic pain often occurs conjointly with SCI (World Health Organization, 2013) and is one of the secondary health conditions that directly impacts active and meaningful participation in life activities (Piatt, Nagata, Zahl, Li, & Rosenbluth, 2016). Chronic pain often leads to the excessive use of prescription opioids as well as other substances with patients often developing drug seeking

behaviors. One study found that addiction rates can increase up to 50% for individuals that experience chronic pain (non-cancer related) when receiving opioids for pain management (Højsted, Nielsen, Eriksen, Hansen, & Sjøgren, 2006). Jeff Sessions, Attorney General of United States, has reported that opioid abuse is a drug crisis in in the United States costing precious lives and money. It has been identified that the Department of Justice and the United States government will use resources to combat this crisis (The White House, Department of Justice, 2018). Research also suggests that alcohol use is the most common factor among people with SCI as the cause of injury and as post-injury adjustment (Kolakowsky – Hayner, Gourley, Kreutzer, Marwitz, Cifu, McKinley, 2002). Additional research suggests that the exact prevalence of substance misuse at time of injury in the SCI population has not been determined (Radnitz & Tirch,1999). Furthermore, it is unclear whether patients are introduced to non-pharmaceutical pain interventions that would be appropriate for individuals who have a history of substance abuse (Heutink et al, 2014).

However, there is still an ongoing debate regarding whether substance use and misuse is a contributing factor to the onset of SCI, and specifically what is the substance used prior to the onset of injury. Therefore, the specific aims of this study are to determine if individuals report positive for substance use at the onset of SCI and to identify what are the primary substances of choice immediately prior to onset of SCI.

Methods

Research Design

Data for this study were drawn from a retrospective chart review of patients' records from the years 2016-2018. Patient charts were obtained from a mid-size safety-net hospital located in a metropolitan city in Indiana, United States. In order to be eligible for a chart pull, the

patient must have experienced a complete or incomplete SCI and be over the age of 18. As a best practice an abstraction sheet and key were developed. The purpose of the abstraction tools is to provide necessary guidelines regarding the data for the reviewer of the charts. The reviewer assessed all substance use (both self-reported and with a standard toxicological panel) excluding tobacco (i.e. illicit drug use, alcohol use, and over the counter medication use) among those who experienced an SCI between the years 2016-2018. The data were analyzed to determine if substance use was present 24 hours prior to injury, and if so, what types of substances were most prevalent. Additionally, it was determined what specific substance was more commonly used prior to SCI.

Sampling Procedures

Data were drawn from a retrospective chart review from patients' records from the years 2016 – 2018. Patient charts were randomly sampled from eligible charts as described in the research design. The medical reviewer removed all patient identifiers including name, date of birth, or address.

Subject Recruitment

A medical professional (physician) identified the charts that will be included in the study; the data were extracted and distributed to the principle investigator of this study located at Indiana University, Bloomington to complete analysis of the data. The research protocol was approved by the Institutional Review Board of Human Subject (IRB) at Indiana University, Bloomington prior to the start of data collection.

Inclusion Criteria

To be eligible for a chart pull, a patient must have experienced a complete or incomplete spinal cord injury and be over the age of 18 between the years 2016-2018.

Procedures

Billing codes, progress notes, admission and discharge paperwork, along with laboratory results were included in the retrospective analysis and chart review. The medical recorder first inspected the medical billing codes. If the information was not noted in the medical code the medical reviewer obtained the information from looking at the physician notes for the qualitative result of cause of injury. The method of abstraction was concluded with the keeper of the medical recorder. Information obtained included age, sex, injury information, toxicology screens, self-report of substance use, what substances were used, employment status, educational level, relationship status, military service, and any non-pharmacological pain treatment methods.

Billing codes from International Classification of Diseases (ICD), progress notes, admission and discharge paperwork, along with laboratory results provided the medical reviewer the necessary information. If the information was unable to be found in the information from the ICD codes, the medical reviewer inspected the chart for a qualitative result. The method of abstraction was concluded with the keeper of the medical recorder.

Measurement Instruments

To ensure consistent data collection, a data abstraction instrument was created (See Appendix A). This document provided the reviewer with an instrument to record the required data. To guarantee reliability, protocols and guidelines for the abstraction were developed prior to the start of data collection (See Appendix B). The abstraction procedure manual provided a clear set of protocols and guidelines that instructed the reviewer in the collection of data. Guidelines for making decisions regarding ambiguous situations was addressed in the manual. The manual discussed how to manage missing data.

Data Collection

To ensure patient confidentiality, a physician working for the hospital selected charts ICD-10 codes S14 (Cervical spinal cord injury), S24 (Thoracic spinal cord injury), and S34 (Lumbar spinal cord injury) that met the inclusion criteria. The chart review conducted by an expert medical professional (physician) distributed the data for analysis to the principle investigator. All data were transferred from the field notes to an excel spreadsheet. All data is protected in a box health account associated with Indiana University with no patient identification associated with the data.

Data Analysis

Descriptive statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) to describe the ways in which the SCI was obtained, sociodemographic variables, toxicology reports, and current employment status to determine substance use at time of injury and substance of choice. Demographic data was also collected and analyzed to provide information about the sample population

Results

A retrospective chart review was completed with a total of 20 participants (17 males and 3 females between the ages of 27 – 76 [$M = 45.05$, $SD = 13.843$]). Results showed that 45% sustained the SCI due to a fall (compared to national average of 28.3%), violence 25% (compared with the national average of 14.6%), vehicular 25% (compared with the national average of 39.2%), other 5% (compared with the national average 9.7%; National Spinal Cord Injury Statistical Center, 2016. (Table 1).

Table 1

Participant Demographics

	Opioids	Alcohol	Marijuana	Methamphetamines	Benzodiazepines	Cocaine	Synthetic Cathinone
Age							
n	6	4	4	2	2	1	1
mean	42.3	41	46.25	41.5	37	27	35
range	27-61	32-53	21-76	32-51	32-42	-	-
Sex							
Male	5	4	4	1	1	1	1
Female	1	-	-	1	1	-	-
Level							
C1-C4	4	-	2	-	-	-	-
C5-C8	-	1	1	-	-	-	1
T1-T5	1	-	-	-	1	-	-
T6-T12	1	2	1	2	1	1	-
L1-L5	-	1	-	-	-	-	-
S1-S5	-	-	-	-	-	-	-
How SCI was Sustained							
Fall	2	2	3	1	-	-	1
Violence	2	1	-	-	1	1	-
Vehicular	1	1	1	1	1	-	-
Other	1	-	-	-	-	-	-
Employment							
Full-time	1	-	-	-	-	-	-
Part-time	-	-	1	1	-	-	-
Unemployed	5	4	3	1	2	1	1

Table 1

Data collection occurred at a level 1 trauma center, the most acute level of care on a range of 1-5. A level 1 trauma center has the necessary equipment and specialized equipment required to address the unique needs of traumatic injuries. Additionally, the staff are specially trained to care for the acutely injured patients (American Trauma Society, 2018). There are 23 total trauma centers within the state of Indiana, where data collection occurred with 4 identified as level 1 trauma centers, with 3 providing trauma care to the adult population.

Data revealed an 80% positive toxicology or self-report of substance use immediately prior to the onset of the SCI. Males were positive for (or reported uses of) more than one substance at a rate of 25% at time of injury. The following substances were identified as used

prior to injury and listed as most to least prevalent: opioids (37.5%), alcohol & marijuana (25%), methamphetamines & benzodiazepines (12.5%), and cocaine and synthetic cathinone (6.25%).

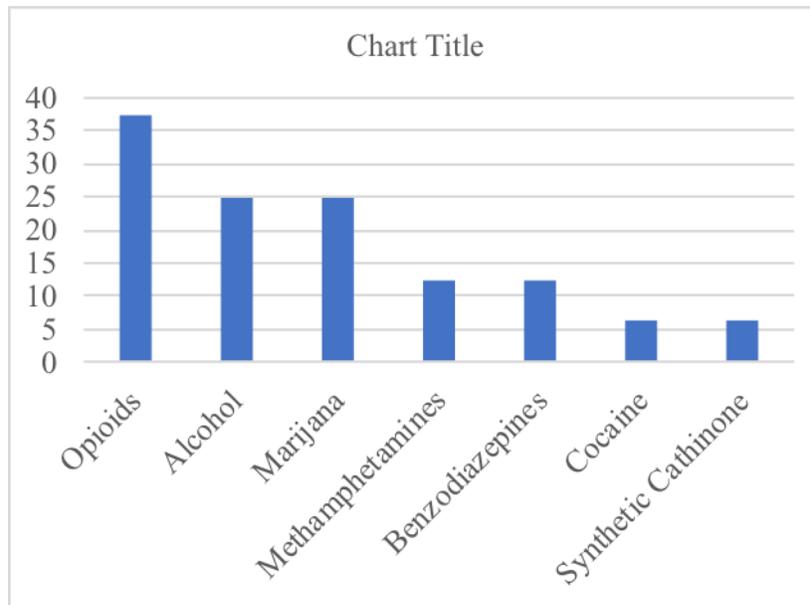


Figure 1. Substances used prior to injury. This figure illustrates the substances used (toxically screen or self – report) prior to onset of SCI.

Additionally, the rate of unemployment prior to injury was 80% for the total population sampled and 81.25% for individuals with positive substance use reported immediately prior to injury.

Discussion

Interpretation of Results

This study determined if individuals reported positive for substance use at the onset of SCI and to identified what are the primary substances of choice immediately prior to onset of SCI. It also identified what the primary substances of choice was immediately used prior to onset of SCI. Of the individual charts that were reviewed, the substances reported were opioids, ETOH, marijuana, methamphetamines, benzodiazepines, cocaine, and synthetic cathinone. Although previous research has indicated that ETOH was identified as the most common

substance used prior to injury occurring (Kolakosky-Hayner et al 1999; Garrison, Glifford, Gleason, Tun, Brown Garshick, 2004) the results from this retrospective chart review identified opioids as the most common substance used prior to injury occurring within this sample population.

Yet, not one of the individuals that were positive for opioids were identified by the medical professional to have pain as a secondary health condition either prior or after injury. The lack of identification of pain can sustainably affect this population because pain has been identified as one of the top secondary health conditions that prevent individuals with SCI in participating in their social participation and has a notable impact in their life (Piatt et al 2015).

Additionally, opioids are typically used to treat moderate to severe pain along with diarrhea and coughing occasionally; thus, the absence of identification of pain as a secondary health issue at the onset of treatment can compounded impact within their life and choices for future treatments. Furthermore, in 2017 The Center for Disease Control and Prevention (CDC) classified the misuse of opioids as an epidemic with in the United States. The CDC has identified Indiana as 1 of the 13 states that has the highest prescription rates for opioids. Consequently, increasing the risk of misuse, abuse and opioid use disorder (addiction) to occur. Hence, a thorough medical history that includes previous pain diagnosis is fundamental and should occur prior to the patient being transferred to a rehabilitation hospital. At which time if pain is not a secondary health diagnosis and if misuse, abuse, or opioid use disorder is suspected a referral to the necessary health care profession should be given.

Therefore, a thorough assessment of risk for substance use (or is it misuse) should occur immediately upon admission for acute care for the sustained SCI. The assessment should include the individual's current and past substance use along with family history of substance use in

combination with standard toxicological panel. The individual should be asked to disclose all current and past prescribed medications taken as well as any medications they have acquired without a prescription (Gourlay et al, 2005). In addition to the intake interview that will include disclosure of substance use by the patient and/or family members, a toxicology panel will confirm the information obtained from the patient.

Limitations

Data were collected from one of the four level 1 trauma hospitals located in Indiana. The data was only collected for 18 months between the years of 2016-2018. Therefore, generalizability cannot be made. The charts collected were the total number of SCI during the allotted time frame using the ICD-10 codes S14 (Cervical spinal cord injury), S24 (Thoracic spinal cord injury), and S34 (Lumbar spinal cord injury).

Implications for Future Research

This study provides a starting point for understanding substance use and the onset of SCI. However, additional research is needed to identify prevention methods regarding substances use and engaging in risky behaviors that put individuals at risk of falls especially while using substances. Furthermore, determining the constraints and the ability of the health professional to identify pain as a secondary health diagnosis within the emergency departments of level 1 trauma facilities. Additionally, research exploring how to effectively communicate between emergency rooms to general health practitioners regarding misuse of substances or of high risk factors for potential misuse or addiction. The determination of that research will prepare care providers to provide crucial referrals to the appropriate care providers to improve quality of care of the individual leading into rehabilitation and community reintegration. Also, further research is needed due to the disproportionate rate of individuals not diagnosed with pain as a secondary

health conditions yet were positive for opioids upon admission. The national concern regarding the opioid epidemic it is of key importance to investigate the diagnosis of pain as a secondary health condition for individuals that are accessing emergency services for a traumatic event such as a SCI.

Implications for Practice

Due to the severity of SCIs and the associated externalized costs, research investigating potential mechanisms for prevention is warranted (Devivo & Sekar, 1997; National Spinal Cord Injury Statistical Center, 2016). There is a wide variety of science-based recommendations for preventive processes for SCI by government and professional bodies (Wyndaele & Wyndaele, 2006; Bellon et al, 2013). The CDC offers a variety of prevention and safety protocols (CDC, 2017). Public health officials aim to prevent SCI using three types of prevention methods: primary (prevention or to stop the disability from occurring), secondary (identifying and stopping a disability), and tertiary (eradicating the disability when symptoms are already evident) (WHO, 2013).

Fall risk should be assessed during medical visits especially related at patients that are taking opioid medications. This includes behaviors that may cause falls such as climbing, vocational duties, or hobbies that can elevate risks of falls. Educational information regarding fall risk prevention is necessary to the prevention of SCI especially for individuals that are using opioids.

Additionally, further prevention efforts regarding gun safety, violence prevention, and substance use while operating a vehicle (car, motorcycle, boat, etc.) is especially necessary and crucial (Bellon et al, 2013) in the prevention of SCI.

Leisure can provide a buffer to negative life experiences, aids in reconstruction of life after a traumatic event, and can be used to improve mood (hope and optimism) (Iwasaki & Mannell, 2000; Tedeschi & Calhoun, 1995). Therefore, a recreational therapist can provide the necessary leisure education and training for all three types of prevention (primary, secondary, and tertiary). This would include leisure time outcomes, leisure awareness, barriers to leisure, motivation, community integration, and leisure exploration.

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Appendix A
Abstraction Form

Variable		
Sex		
Age		
ASIA Classification		
How Injury Occurred		
Positive Toxically (Yes/No)		
If + what Substance		
Self-Reported Use		
Relationship Status		
Educational level		
Employment Status		
Veteran		
Non-pharmacological Pain treatment Methods		
Medical Diagnosis Axis I-IV		
Additional information that relates to substance use prior to injury		
Pain listed as secondary health condition		

Appendix B

Abstraction Manual

1. Sex

Sex	Code
Male	1
Female	2
Transgender	3
Not Noted	4

2. Age: _____

a. (Enter exact age)

3. ASIA Classification _____

a. (enter ASIA Classification-level of injury & complete/incomplete)

4. How Injury Occurred _____

a. (describe incident)

5. Negative/Positive Screen (List all that apply)

- a. Negative (1)
- b. Positive via toxically screen (2)
- c. Positive identified via self-report (3)
- d. Positive identified via other mechanism (4)

Name of Drug	Value
Alcohol (ETOH)(1)	
Amphetamines/Methamphetamines(2)	
Barbiturate(3)	
Benzodiazepines(4)	
Methadone(5)	
Cocaine(6)	
Phencyclidine (PCP)(7)	
Tetrahydrocannabinol (THC) (Marijuana)(8)	
Opioids (heroin, codeine, morphine)(9)	
Steroids(10)	
LSD(11)	
Synthetic Stimulates(12)	
Synthetic Cannabinoids(13)	
Ketamine(14)	
MDMA 3,4-methylene-dioxymethamphetamine (Ecstasy) (15)	
Other: (List)_____	
Other: (List)_____	

Other: (List)_____	
Other: (List)_____	

6. Relationship Status

Relationship Status	Code
Single	1
Married	2
Married & Separated	3
Divorced	4
Widowed	5
Long – Term Relationship (over 7 years)	6
Not Noted	7

7. Educational Level

Educational Level	Code
8 th grade	1
Some High School	2
High School Diploma	3
GED	4
Some College	5
Bachelor's Degree	6
Master's Degree	7
Phd	8
Trade School _____	9
Not Noted	0

8. Employment Status at time of injury

- a. Unemployed (1)
- b. Part time employed 29 hours (2)
- c. Full time (3)

9. Veteran

- a. Yes (1)
- b. No (2)

10. Non-Pharmacological Pain Treatment Methods

Treatment Methods	Code
Recreational Therapy	1
Acupuncture/Acupressure	2
Meditation	3
Ice/Heat	4
Essential Oils	5
Massage Therapy	6
Talk Therapy	7
Physical Therapy	8
Other _____	9
Not Noted	0

11. Medical Diagnosis Axis I-IV _____

12. Additional information that relates to substance use prior to injury

13. Pain listed as a secondary health condition

- a. Yes (1)
- b. No (2)
- c. Not Noted (3)

Appendix C

Letter to Medical Professional

December 17, 2017

From: Lori Eldridge

Graduate Assistant/Student | Indiana University, Bloomington School of Public Health |
1025 7th Street | Bloomington | IN | 47405

To: Steven P. Gerke, MD

Assistant Professor of Clinical Medicine | Indiana University School of Medicine |
FT F2-600 INTM, Indianapolis, IN (spgerke@iu.edu)

Dear Dr. Gerke

My name is Lori Eldridge and I am a Masters student at Indiana University, Bloomington, School of Public Health. My thesis project; *Relationship between substance use and the onset of spinal cord injuries: A medical chart review* was recently approved by my committee, including, Dr. Jon Agley, committee member. Dr. Agley suggested that you may be able to facilitate data collection for my project. The data collection would consist of a chart pull and de-identified data abstraction from approximately 50 to 100 records. If the person who assists me is an IU employee, Dr. Agley may also be able to provide a small amount of supplemental pay for these efforts. In addition, we would be more than happy to discuss the potential for authorship on manuscripts submitted for publication from this study.

The specific aims for the project are: 1) Determine if there is a significant correlation between substance use and the onset of SCI and 2) Identify the primary substance of choice immediately prior to onset of SCI. To be eligible for the study, the patient must have sustained a complete or incomplete SCI, be over the age of 18 and not have passed away 3 months post injury. The information abstracted from the charts will include: sex, age, ASIA score, positive reports of substance abuse and if so what substance were used, educational level, relationship status, military status, mental health diagnosis, and if any non-pharmacology interventions were prescribed during treatment.

If you or one of your staff (e.g., medical resident) are interested in further information, I would be happy to meet with you in person (Indianapolis) or over the phone. Data collection is slated to start January 29, 2018 therefore if you can get in contact with me by January 19, 2018 indicating if you are able to assist with data collection that would be greatly appreciated.

Sincerely,

Lori Eldridge
Graduate Assistant/Student

Lori Ann Eldridge

906 West Countryside Lane
Bloomington, IN 47403

(310)916-7634
loeldrid@indiana.edu

EDUCATION

Master in Public Health May 2018

Indiana University, Bloomington. Bloomington, Indiana.

Major: Recreation Administration

Emphasis: Recreational Therapy

Bachelor in Science in Leisure Sciences May 2003

California State University, Sacramento. Sacramento, California.

Major: Leisure Science

Emphasis: Therapeutic Recreation

Associate of Arts in Liberal Studies December 2000

Cabrillo College. Aptos, California.

Major: Liberal Studies

TEACHING EXPERIENCE & TRAINING

Indiana University, Bloomington

Participated on the following Research Teams:

- *Community Based Rehabilitation Team* (Spinal Cord Injury and Sexuality Research Team). Lead by Dr. Piatt. (Fall 2016, Spring 2017, Summer 2017, Fall 2017, Spring 2018);
- *Health Enhancing PA Project*. Lead by Dr. McCormick. (Fall 2016, Spring 2017);
- *Paro In-Home Study*. Lead by Selma Sabanovic. (Summer 2016, Fall 2016, Spring 2017, Summer 2017, Fall 2017, Spring 2018).
- *Cross-Cultural Equine Assisted Therapy*. Lead by Shay Dawson. (Spring 2017, Summer 2017, Fall 2017, Spring 2018).

Co-Taught the following courses:

- SPH – R-210 Inclusion in Recreation, Parks and Tourism (Spring 2017) 86 Students
- SPH – Y-470 Contemporary Issues in Recreational Therapy. (Fall 2016) 36 Students.

- SPH – R-250 International Comparative Exchange: Services for Children with Disabilities (Summer 2017, Summer 2018).

Taught the following course:

- SPH-Y-379 Recreation Assessment and Planning Lab (Spring 2018). 46 Students.
- SPH-Y-378 Recreation Assessment and Planning Lab (Fall 2017). 46 Students

PROFESSIONAL EXPERIENCE

Director – The Milieu Center – Sierra Brooke Inc., Sacramento, California, 2007 – 2016

Recreational Therapist Consultant – Sacramento, California, 2012 – 2016.

Director of Adjunctive Therapy – Del Amo Hospital, Torrance, California. 2004 - 2007.

Recreational Therapist – Del Amo Hospital, Torrance, California. 2003-2004.

Recreational Therapist – University of California, Los Angeles Neuropsychiatric Institute, Los Angeles, California. 2003.

Director – Sierra Brooke Care Home, Sacramento, California. 2002.

PRESENTATIONS

Sabanovic, S., Bennett, C., Piatt, J., Nagata, S., **Eldridge, L.**, Randall, N., (2017). *A robot a day keeps the blues away: In home use of socially assistive robot by older adult reduces clinical depression.* Poster presented at the International Conference on Healthcare Informatics, Park City, UT, August 25, 2017.

Eldridge, L., (2017). PhotoVoice – Creating Understanding using Photos. Presented at Bradford Woods Recreational Therapy Student Conference, Martinsville, IN.

Eldridge, L., (2017). Stress Management – Back to the Basics. Presented at Bradford Woods Recreational Therapy Student Conference, Martinsville, IN.

J. Taylor & **Eldridge, L.** (2017). PhotoVoice – An Innovative Data Collection Method. Presented at Academy of Leisure Science, Indianapolis, IN.

J. Taylor & **Eldridge, L.** (2016). Bridging the Gap between Recreational Therapy and Public Health. Presented at Recreation Therapy Institute of Indiana, Florence, IN.

Piatt, J.A., Sabonovic, S., Nagata, S., Bennett, C., Shibata, T., & **Eldridge, L.** (September 2016). *The future is now: The concept, research, and application of socially assistive robots to recreational therapy practice.* American Therapeutic Recreation Association Annual Conference, Chicago, Ill, September 11, 2016.

Eldridge L., C. Karademos, J. Errol (2009). *Keep it Simple and Sensible*. Presented at California Parks and Recreation Society District Retreat, Sacramento, CA.

C. Karademos & **Eldridge, L.** (2011). *Introduction to Facility Dogs*. Presented at California Parks and Recreation Society District Conference, Long Beach, CA.

C. Karademos & **Eldridge, L.** (2014). *Scrapbooking – A treatment modality for all*. Presented at California Parks and Recreation Society District Conference, Sacramento, CA.

Eldridge, L., A. Gallardo (2013). *Simplify- Simply, Take it Easy, Relax, Exercise, Soothe, Self-Aware*. Presented at California Parks and Recreation Society District Conference, Ontario, CA.

Eldridge, L. (2012-2015). *What is Therapeutic Recreation?* Presented at California Community Care Licensed Facilities, Sacramento, CA.

Eldridge, L. (2012-2015). *Barriers to Leisure and Recreation*. Presented at California Community Care Licensed Facilities, Sacramento, CA.

Eldridge, L. (2012-2015). *Adaptions for your population*. Presented at California Community Care Licensed Facilities, Sacramento, CA.

Eldridge, L. (2012-2015). *Skills of Communication*. Presented at California Community Care Licensed Facilities, Sacramento, CA.

INVITED PRESENTATIONS

Eldridge, L. & Errol, J. (2009 - 2016). Professional development in recreational therapy. Invited to present to RPTA 30 – Introduction to Recreational Administration as California State University, Sacramento.

Eldridge, L. & Taylor, J., Errol, J. (2014). Professional development in recreational therapy. Invited to present via webinar Indiana University at Bloomington.

Eldridge, L., Nagata, S. (2016). The Future is Now. Conceptualization, Research, and Applications of Socially Assistive Robots in Recreational Therapy Practice. Presented at Ivy Tech Community College, Bloomington, IN.

Eldridge, L., N. Randall (2017). The Future is Now. Conceptualization, Research, and Applications of Socially Assistive Robots in Recreational Therapy Practice. Presented at Ivy Tech Community College, Bloomington, IN.

Eldridge, L. & Taylor, J., (2018). Integrated Research Teams. Invited training at Eppley Institute, Indiana University at Bloomington.

INVITED PRESENTATIONS

(2018). Recreational Therapy Presentation. University of Belgrade, Faculty of Special Education and Rehabilitation.

(2018). Recreational Therapy Presentation. University of Zagreb, Faculty of Special Education and Rehabilitation.

CONFERENCE PROCEEDING (Published, In Press, or Accepted)

Conference Proceedings (Published, In Press, or Accepted):

Sabanovic, S., Bennett, C., Piatt, J., Nagata, S., **Eldridge, L.**, Randall, N., (2017). *A robot a day keeps the blues away: In home use of socially assistive robot by older adult reduces clinical depression*. Poster presented at the International Conference on Healthcare Informatics, Park City, UT, August 25, 2017.

Collins, S., Sabanovic, S., Fraune, M., Randall, N., **Eldridge, L.**, Piatt, J., Bennett, C., Nagata, S., (2018). *Sensing Companions: Potential Clinical Uses in Robot Sensor Data for Home Care of Older Adults with Depression*. Poster presented at IEEE International Conference on Human-Robot Interaction, Chicago, IL, March 05, 2018.

HONOR & AWARDS

2018 – Recipient Outstanding Graduate Student in Recreational Therapy

2015 – Recipient California Park and Recreation Society – Merit Award

1998 – 2001 Recipient Sierra Pacific Scholarship

GRANTS

Eldridge, L.	2018
RT Small Grant Award	Awarded \$829
Department of Recreation, Parks, and Tourism Studies	

Eldridge, L.	2018
RT Small Grant Award	Awarded \$500
Department of Recreation, Parks, and Tourism Studies	

Eldridge, L. , Piatt, J.	2018
RT Small Grant Award	Awarded \$500
Department of Recreation, Parks, and Tourism Studies	

Eldridge, L.	2018
RT Small Grant Award	Awarded \$425

Department of Recreation, Parks, and Tourism Studies

Eldridge, L., Kinsey H. 2016
Department of Developmental Services State of California Awarded \$250,000
Alta California Regional Center.

Eldridge, L., De La Paz, L., Kinsey H. 2016
Department of Developmental Services State of California Awarded \$150,000
Alta California Regional Center.

MEMBERSHIPS

- California Parks and Recreation Society (CPRS) Therapeutic Recreation Section
 - Education Director
 - Education Director Elect
 - Marketing Director
 - Speaker/Professional development

CERTIFICATIONS

- Certified Therapeutic Recreational Specialist
 - Recreation Therapist Certified – 32667
- California Board of Recreation and Park Certifications
 - Recreation Therapist Certified – 4039-T
- CBEST Certificate (2003)
- Continue Education Unit (CEU) provider through community care licensing (2008 to 2016)
- Collaborative Institutional Training Initiative: Good Clinical Practice (GCP); Social and Behavioral Responsible Conduct of Research; Social/Behavioral Researchers (2016)
- Sexual Misconduct Policies, Procedures, and Resources: Graduate Student Training (2017)
- Certified CPR/First Aid (2002 – 2016)
- Certified Crisis Intervention Prevention (2008 – 2016)
- Certified Professional Assault Responsive Specialist (2003 – 2008)
- Indiana University Certificate on Recognizing Plagiarism (2016)