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Increasing Social Inclusion and Engagement of Exercise for Individuals with Spinal Cord Injuries: A Universal Resource Development for Wellness Facilities

Alexa Hall

Medical University of South Carolina

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Increasing Social Inclusion and Engagement of Exercise for Individuals with Spinal Cord Injuries: A Universal Resource Development for Wellness Facilities

Created by: Lexi Hall, OTDS

Faculty Mentor: Dr. Scott Hutchison , OTD, OTR/L

Site Mentor: Cindi Day

College of Health Professions, The Medical University of South Carolina



Background & Significance

- Individuals with spinal cord injuries (SCIs) are 1.5 times more likely to decrease engagement in exercise one year following their injury (Baehr et al., 2022).
- 80% of SCI survivors agree that exercise is critical for overall health and being active on a consistent basis (Baehr et al., 2022).
- Analyses showed that those who had a SCI were significantly more likely to have a greater quality of life overall when participating in physical; a positive relationship was observed between physical activity and social community (Tomasone et al., 2016). However, only 50% of individuals with SCIs participate in consistent exercise activity (Baehr et al., 2022).
- Common challenges were: (1) adjustment to post-SCI shock, (2) inadequate education once rehabilitation secedes, and (3) environmental limitations involving exercise (Baehr et al., 2022).
- The literature has shown that there is a gap in program development between SCI survivors and the fitness facility community.

Needs Assessment Findings

Chart 1.

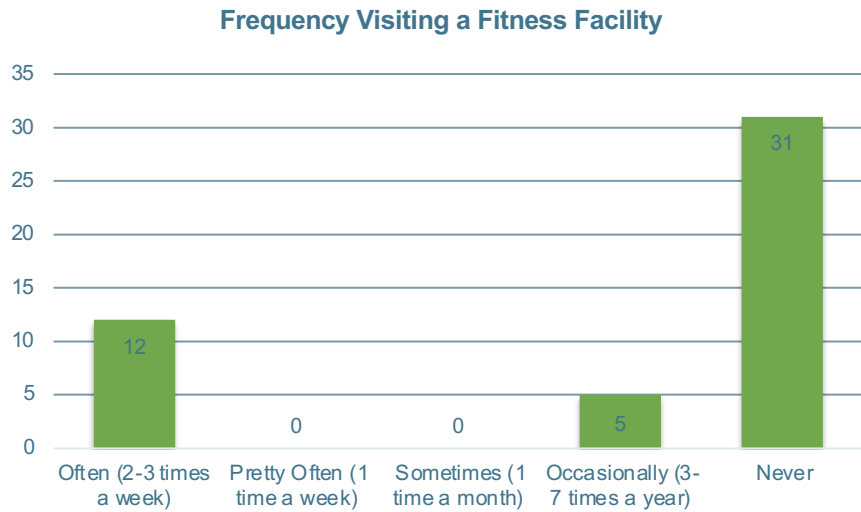


Chart 2.

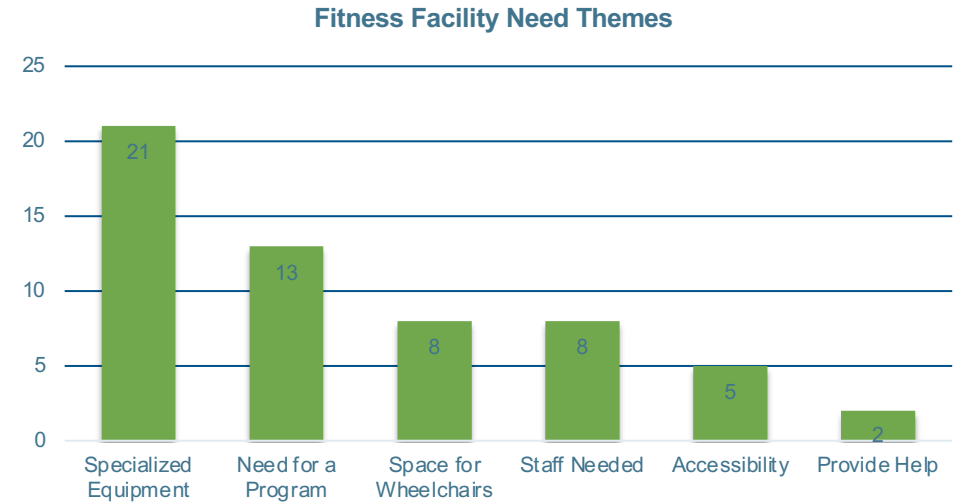
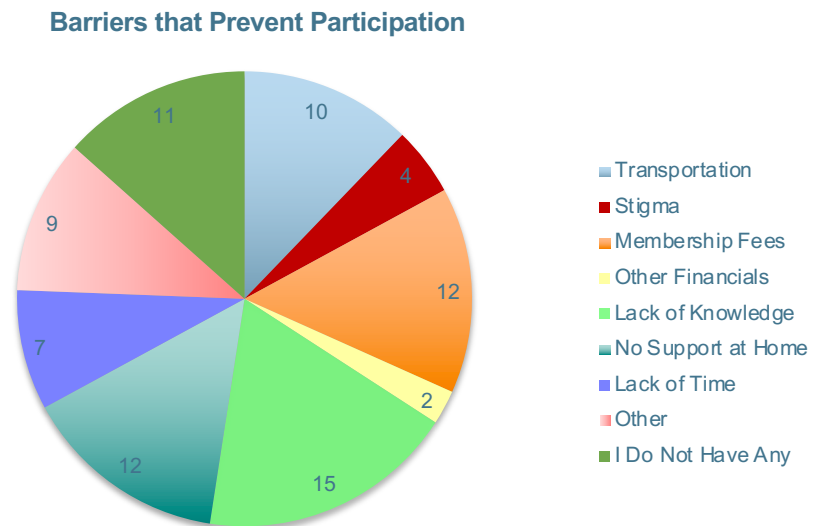


Figure 1.



Purpose

- Create a wellness program, or “toolkit”
- Cater this towards individuals with SCIs, which targets the gap that has been identified

Aims

- Reducing the gap will increase social inclusion and participation of exercise for individuals with SCIs.
- Facilitates a knowledgeable, friendly, and accommodating environment that promotes a healthy quality of life.

Supporting Framework

The Canadian Model of Occupational Performance and Engagement (CMOP-E) encourages the social and physical participation of exercise.

Stakeholders Involved



Individuals with SCIs

49 were involved with the development of the toolkit

14 were involved during the implementation at the MUSC Wellness Center



Personal Trainers



MUSC Wellness Center & Staff

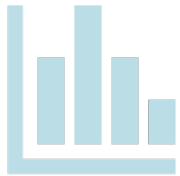


Hospital-Based Therapy Clinics



Other Wellness/Fitness Facilities across the Carolinas

Methods



Project Type:

Quality improvement using mixed methods of qualitative and quantitative data



Participants: 14 individuals

Differing in age, gender, ethnicity, duration of injury, level of injury, type of injury, and other health complications.

Inclusion criteria for participants were age of 18+, currently residing in South Carolina, and at least one-year post-injury

Recruitment: SCI organizations, support groups, and clinical therapists

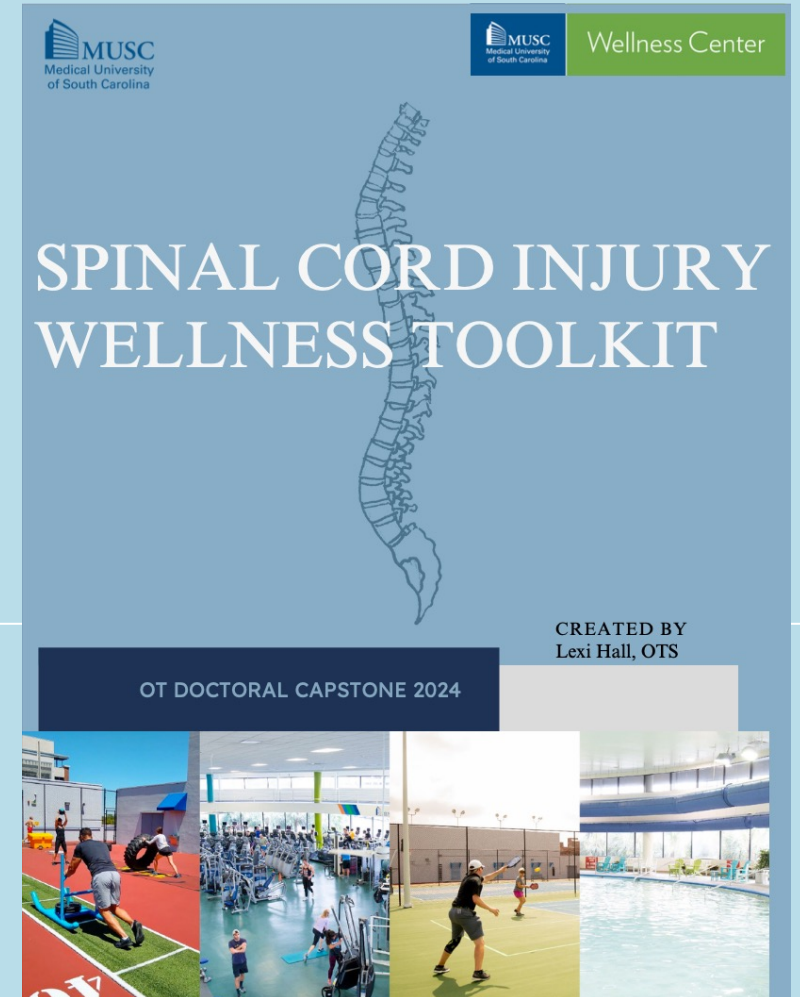


Data Collected:

Pre-implementation surveys inquired about level of injury, precautions, experience with various aspects of a gym environment, and interest in a wellness program.

Post-implementation survey collected data on likes, dislikes, and future changes for the toolkit.

Capstone Experience & Project Deliverable



Spinal Cord Injury Wellness Toolkit

Description: This universal wellness toolkit provides an extensive list of ways in which gyms can create an accommodating environment for individuals with SCIs and can be used by the individuals themselves, their caregivers, or certified personal trainers.

When: After several weeks of research, observation, and conversations with individuals with SCIs, implementation took place at week 7. The “pilot” at the MUSC Wellness Center lasted for 3 weeks.

Level of Injury

This toolkit is typically meant for individuals who possess a C5 injury and below. However, if an individual possesses a C4 injury or above, it should not exclude them from active participation in a gym. An open conversation will be needed to discuss whether public participation is exercise appropriate for them at that time. Facilities that implement this toolkit may choose to deny services if believed they are putting the individual, or themselves, at risk. Staff have the authority to ask for a referral and/or home exercise program from the individual's OT/PT.

These are general muscle interventions and movements performed at a **COMMUNAL** level of injury. For injuries that are incomplete, exercises may include more than listed. It is important to discuss the individual's presentation of injury if providing personal training services.

C5:
Functional muscles include deltoids, biceps, brachialis, brachioradialis, rhomboids, and serratus anterior.
Exercises focus on shoulder flexion, abduction, and extension, elbow flexion and supination; scapular adduction and abduction.

C6:
Functional muscles include clavicular head of pectoralis major, extensor carpi radialis longus and brevis, serratus anterior, and latissimus dorsi.
Exercises focus on C5 level movements plus scapular mobility, supination, and wrist extension.

C7-C8:
Functional muscles include sternal head of pectoralis major, triceps, pronator quadratus, extensor carpi ulnaris, wrist flexors, finger flexors and extensors, and thumb function.
Exercises focus on C6 level movements plus elbow extension, wrist flexion, and functional grasp.

T1-T9:
Functional muscles include entirety of hand, erector spinae, and intercostals.
Exercises focus on C7-8 level movements plus trunk stability/balance, and cardiovascular endurance.

T10-L1:
Functional muscles include majority of core.
Exercises focus on T1-9 level movements plus core stability and balance.

L2-S5:
Functional muscles vary from each level and can include hip flexors, extensors, abductors, and adductors; knee flexors and extensors; ankle dorsiflexors and plantar flexors.
Exercises focus on T10-L1 level movements plus the corresponding inverted lower extremity muscles.

*Information has been obtained from *Conservatism for Spinal Cord Medicine* (2009). Please visit article to gain a greater knowledge base for higher cervical levels of injury.

Precautions & Protocols

Individuals with SCIs are experts of their own bodies. For most of these individuals, when unusual/concerning symptoms arise, they know what steps need to be taken to return to their baseline. However, it is important for gym staff and trainers to be obtained with common SCI precautions and protocols in the event of an unforeseen circumstance.

Autonomic Dysreflexia (AD)

- The body's response due to a disconnect between the "brain and body"
- Usually occurs for individuals who possess T6 and above injury and when pain/discomfort is occurring at or below the level of injury
- Symptoms: increase in BP and HR, headaches, sweating above the level of injury, or flushing in face/neck
- Causes can include: UTIs, changes in bowel program, overfilling of the bladder, pressure sores, ingrown toenails, tight clothing/shoes, fractures, sexual activity
- What To Do: Keep person in upright sitting position, check BP, check for kinks in catheter, ask about cathing/bowel program, loosen abdominal binder/LE ACE wraps if applicable, check for any redness/cuts/sores. If symptoms do not subside/BP continues to increase, call 911

Orthostatic Hypotension (OH)

- A drop in BP when coming from a supine to sitting position; usually occurs with 20 point systolic drop or 10 point diastolic drop in BP
- More common with individuals with a T6 or above injury
- Symptoms: lightheadedness, dizziness, nausea, vision changes
- What To Do: lie person down into a supine position; if in a wheelchair, lift legs or recline chair
- If symptoms subside once laying back down, keep in comfortable position OR gradually position individual in semi-supine while monitoring their BP
- If symptoms persist, seek medical assistance

Temperature Considerations

- When obtaining a SCI, the body has difficulty regulating it's temperature relative to the environment due to a disconnect of sensory information traveling to brain
- During exercise, individuals body temperature can increase (hyperthermia)
- Individuals may experience increased HR, headaches, nausea, or blurred vision
- If so, cease activity and cool body down

Equipment for Purchase cont'd

Adaptive Rowing Machine (AROW)

- Use QR code to visit website on how to adapt a Concept 2 rowing machine
- Research was conducted in 2022 to measure the effectiveness of the AROW:

Wong, B. N., Howard, A. L., Howard, B., Larkin, J. J., Howard, J., Chaffin, J., Saper, C. J., & Kramarow, M. B. (2022). Exploring exercise participation and the usability of the adaptive rowing and arm crank ergometer through simulated user perspectives. *Disability and Rehabilitation*, 64(15), 1993-2004. <https://doi.org/10.1080/09638237.2021.1984241>

Concept 2 SkiErg with PMS (\$850)

- Provides the same concept as a skiing machine without the floor stand creating space for wheelchair accessibility.

Mycycle Pro (\$9,000)

- One variation of a functional electrical stimulation (FES) bike.
- Electrical impulses are sent through electrodes that are placed on specific areas of the body to promote movement and blood flow.
- No specialized training is needed.

Wheelchair Treadmill (~\$870)

- Accessible to those with a manual wheelchair.
- Allows for engagement in stationary cardiovascular exercise

The ProTone Fitness Machine (\$6,379)

- Allows individuals to independently exercise without assistance.
- Numerous exercises can be performed while sitting in a manual or powerchair and possess an adaptive gripping mechanism.
- Exercises include but not limited to: chest press, back rows, tricep pushdowns, latissimus pulldowns, shoulder abduction, external/internal rotation, and bicep curl.

Stretches & Exercises cont'd

If needed, please see **Page 5** to gain general knowledge on how different spinal cord injury levels present when engaging certain muscle groups. Here is a list of exercises that can be performed, and a guide for certified personal trainers and gym staff. However, most individuals with SCIs will be prescribed with a home exercise program (HEP) given by their OT/PT to follow. Gyms should accommodate to these individuals when needed.

Shoulder

- Front raise (with thumb facing up): see **Figure 1**
- External rotation: see **Figure 2**
- Lateral raise
- Reverse shoulder fly: see **Figure 3**
- Face pulls
- Shoulder press

Triceps

- Tricep pushdowns: see **Figure 4**
- Tricep kickbacks

Back

- Back rows: see **Figure 5**
- Lat pulldowns
- Wheelchair push-ups with back extension to sitting position

Core

- Cable twists: see **Figure 6**
- Russian twists

Biceps

- Bicep curl
- Hammer curl

Cardiovascular endurance

- Rope pull machine
- Rowing machine
- Adaptive jump ropes
- Wheelchair propulsion on track
- Skating machine
- Arm cycling

All exercises can be performed with any equipment listed above (i.e. cable machine, dumbbells, smith machine, etc.)
* Exercises were adapted from the *Shepherd Center (How: Exercises)*.

Spinal Cord Injury Wellness Toolkit



Delivery: 14 participants were involved

- Participants visited the MUSC Wellness Center to be given an orientation on the toolkit and a tour of the facility.
- Provided education and application of specific aspects of the toolkit.
- Demonstrated ways in which it can be used at any gym facility.
- Participant Feedback:
 - “I liked that I get to be creative with adaptive uses to ordinary gym equipment and implementation of special equipment for other exercises otherwise on unobtainable”
 - “The very details defined layout description of the equipment and the different layouts of levels of spinal cord injuries for anyone that helps them in the gym”
 - “The wellness toolkit is just a great guide for people with SCI's, OT's, PT's, and gym personnel. What I liked best about it, is that it's full of great ideas for exercises!”

Pre-Implementation Survey

Thematic Analysis:

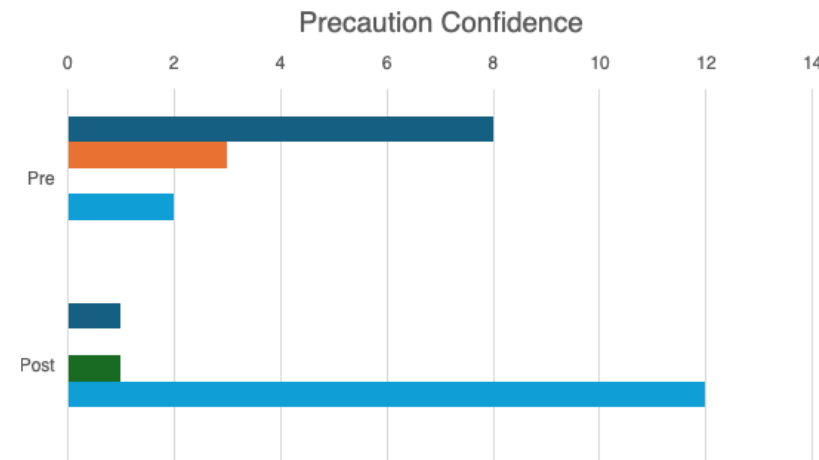
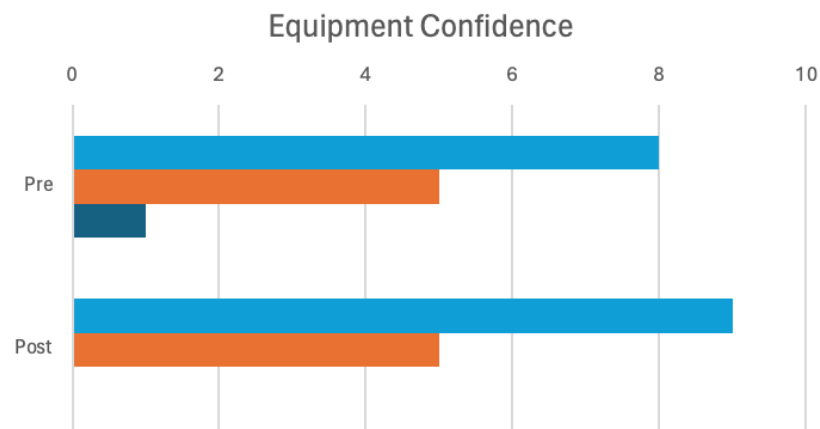
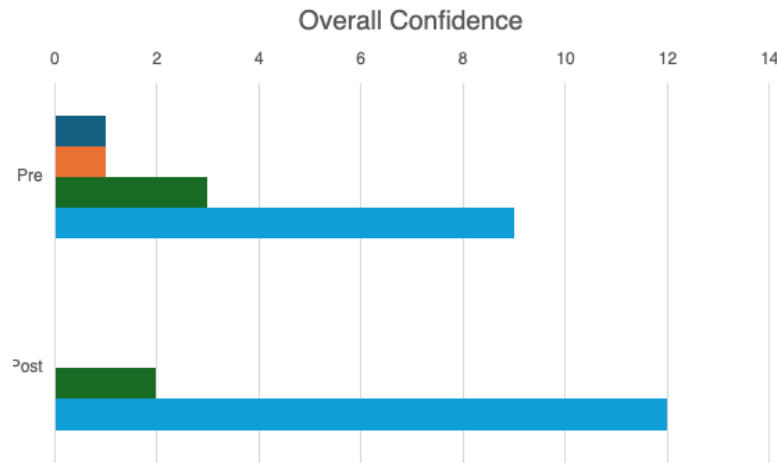
- 79% have had their injury for 10+ years.
- 100% have received OT/PT services.
 - Only 28% stated that their therapist was able to refer them to a SCI-accommodating gym.
- 58% did not participate in exercise.
 - Disengagement due to inaccessibility, lack of transportation, lack of time/employment, was told to not be beneficial, and lack of knowledge.
- 100% of participants believed exercising in a SCI-accommodating gym would benefit their overall health and quality of life
- Toolkit content requests included: adaptable equipment, exercises, safety protocols, ways to individualize training, and accessibility

Post-Implementation Survey

Thematic Analysis from the 14 participants:

- Likes:
 - Provides security & safety, adaptability, provides various kinds of equipment, versatility, easily understood, caters to a wide variety of injury levels, and increases confidence & quality of life
- Dislikes:
 - Limited to individuals with C5 injuries and below
- Changes:
 - Extend to higher level injuries

Survey Comparison



■ Clueless
 ■ Not very confident
 ■ Pretty confident
 ■ Very confident

Overall & Potential Impact

This toolkit has been shared with:

- MUSC Wellness Center and Trainers
- MUSC Research Affiliates
- Occupational & Physical Therapists
- National SCI Support Groups
- The 14 participants
- Prisma's new SCI-accommodating fitness facility
- Hospital-based OP therapy clinics
- MUSC NExT Wellness Center
- 10 Fitness Facilities across SC
- Distribution to the MUSC Wellness Center, individual participants, support groups, clinical websites, OT/PTs, and fitness facilities across the Carolinas will further increase social inclusion, engagement, and quality of life for individuals with SCIs.

Sustainability

- This deliverable has been copyrighted for further distribution to other rural gyms across the Carolinas and US.

Methods cont'd

Strengths:

- REDCap surveys helped to gather crucial data in a fast, efficient, and honest way
- Increased familiarity with capstone site allowed for a smooth “pilot”

Limitations:

- Individuals were only able to receive 1 tour limiting carryover of knowledge and would need continued exposure
- Could not officially implement toolkit

Measure of Effectiveness



Pre & Post implementation surveys:

- Showed an increase in confidence levels after implementation
- Allowed for critical feedback to be given to increase the toolkit effectiveness



Experienced MUSC research affiliates, large SCI organizations, and wellness facilities have provided feedback to further increase effectiveness.

Recommendations

- Implementation at the MUSC Wellness Center including:
 - Investing in adaptable equipment
 - Increase SCI clientele for personal trainers
 - Make implementation known to hospital-based OP clinics
 - Educate current & future staff on toolkit for increased awareness
- Continue to create an accommodating and inclusive environment for this group of individuals who have an increased need for exercise.

Potential Impact for OT

- The role that OT has for increasing engagement in IADLs (i.e., exercise), social inclusion, and overall quality of life for the SCI population.

Conclusion

- Increased awareness and representation of the SCI population was needed in the fitness community.
- A wellness program was constructed to increase knowledge for wellness centers and aid in participation for the SCI population.
- Future implementation at other facilities will increase social inclusion and engagement of exercise for these individuals.

Acknowledgements

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Capstone Coordinator: Dr. Joy Crawford, OTD, MSRS, OTR/L

Capstone Site and Staff: MUSC Wellness Center

Other Contributors: MUSC Research Affiliates, MUSC OTs & PTs,
and SCI Support Group Directors

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