

UNIVERSITY OF WISCONSIN-LA CROSSE

Graduate Studies

A COMPARISON OF PHYSICAL EDUCATION CONTENT PRIORITIES OF
TEACHERS AND HEALTH PROFESSIONALS FOR INDIVIDUALS
WITH TRAUMATIC BRAIN INJURY

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the
Master of Science Degree in Exercise and Sport Science-Physical Education Teaching
Adapted Physical Education Concentration

Erin Siebert

College of Science and Health
Adapted Physical Education

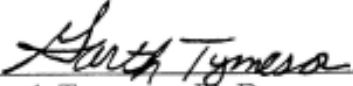
August, 2012

A COMPARISON OF PHYSICAL EDUCATION CONTENT PRIORITIES OF
TEACHERS AND HEALTH PROFESSIONALS FOR INDIVIDUALS
WITH TRAUMATIC BRAIN INJURY

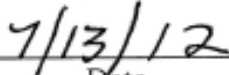
By Erin Siebert

We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the Master of Science Degree in Exercise and Sport Science-Physical Education Teaching (Adapted Physical Education Concentration)

The candidate has completed the oral defense of the thesis.



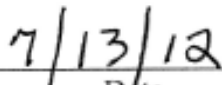
Garth Tymeson, Ph.D.
Thesis Committee Chairperson



Date



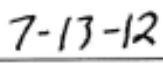
Patrick DiRocco, Ph.D.
Thesis Committee Member



Date

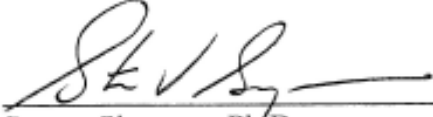


Richard Mikat, Ph.D.
Thesis Committee Member

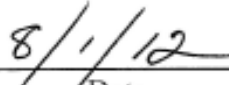


Date

Thesis accepted



Steven Simpson, Ph.D.
Graduate Studies Director



Date

ABSTRACT

Siebert, E. A comparison of physical education content priorities of teachers and health professional for individuals with traumatic brain injury. MS in Exercise and Sport Science-Physical Education Teaching, Adapted Physical Education Concentration, August 2012, 118pp. (G. Tymeson)

Due to the diversity of characteristics of students with Traumatic Brain Injury (TBI) a team of professionals is needed to address a wide variety of health conditions. Because of this many students with TBI may require specially designed physical education. The movement concerns addressed within adapted physical education may involve any part or all of the physical education curriculum content. To determine which physical activities best serve students with TBI a comparison of physical education content priorities was conducted among adapted and general physical educators (n = 122), physical therapists (n = 51) and medical personnel (n = 20). Online surveys evaluated perceptions of physical education content priority areas, emphasis placed on affective domain areas, and level of communication among these professionals. Results indicated that the three groups agreed strongly on the top two content areas, Balance and Gait Training (1) and Body and Spatial Awareness (2), and the two lowest ranked areas, individual (10) and team sports (11). Medical personnel differed strongly in three other content areas, most notably Transitioning from School-based to Community Based Physical Activity, compared to the adapted and general physical educators and physical therapists. All three groups agreed on the top affective area of Self-Esteem.

ACKNOWLEDGEMENTS

I would like to thank Dr. Garth Tymeson for his direction and guidance throughout the developmental process and for his enthusiasm and patience throughout the project. You are an expert that knows his stuff and inspires those around you to expect excellence and give only their very best. I would also like to thank Dr. Patrick DiRocco for serving on my committee and for his support, direction, and expertise. Last, but certainly not least, I would like to thank Dr. Richard Mikat for serving on my committee and for all his time, technical advice, and energy spent helping me with this project.

Thank you to all of the wonderful individuals that took time out of their very busy schedule to complete my survey. I would also like to thank Dr. John Temple, Dr. Scott Escher, nurse practitioners Sharon Bud and Barb Van Dreesse, physical therapist Nancy Riethel, and adapted physical educator Jim Cappuccio, for their valuable insights with the pilot study and their creative efforts in distributing my surveys.

Thanks to Dr. Manny Felix and Mrs. Cathy (Mama Cath) Jambois for all of their understanding and encouragement through this process. Your support has made a world of difference. I would like to thank the other graduate assistants: Ali, Ally, Ashley, Casey, Judy, Nick, and Rachel. Together we became a functional dysfunctional family to support, encourage, and, yes, at times carry one another.

Lastly, I would like to thank my family, especially my sister, Lauren, for having enough patience and understanding to listen to endless conversations about my topic, and my brother, Ben, for encouraging me to follow my dreams all the way to Wisconsin. Thank you to my mom, Suzanne, you are the voice of reason inside my head and my dad, Donald Holmes Siebert III, thank you for always being so proud of me. Thank you all so much for making this journey an enjoyable and memorable one.

TABLE OF CONTENTS

	PAGE
ABSTRACT.....	iii
ACKNOWLEDGMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES	vii
LIST OF APPENDICES.....	viii
INTRODUCTION.....	1
METHODS.....	7
Pilot Study.....	7
Participants.....	9
Procedures.....	10
Measures.....	12
Teacher Survey	12
Medical Personnel Survey.....	14
Physical Therapist Survey.....	15
Statistical Analysis.....	15
RESULTS.....	17
Frequency of Communication between APE/GPE, MP, and PTs	17
Priority Rankings of Curriculum Content.....	18
Priority Rankings of Affective Domain Areas.....	20
Priority Ratings of Curriculum Content.....	21
Priority Ratings of Affective Domain Areas	25
Rankings from Ratings for Curriculum Content	26

DISCUSSION.....	28
CONCLUSION.....	40
REFERENCES.....	43
APPENDICES.....	45

LIST OF TABLES

TABLE	PAGE
1. APE/GPE, MP, and PT Frequency of Communication.....	18
2. APE/GPE, MP, and PT Mean Rankings (1-11) on Curriculum Content.....	19
3. APE/GPE, MP, and PT Mean Rankings (1-5) on Affective Domain Areas	20
4. APE/GPE, MP, and PT Mean Ratings (0-100) on Elementary Curriculum Content.....	21
5. APE/GPE, MP, and PT Mean Ratings (0-100) on Middle School Curriculum Content	23
6. APE/GPE, MP, and PT Mean Ratings (0-100) on High School Curriculum Content	24
7. APE/GPE, MP, and PT Mean Ratings (1-5) on Affective Domain Areas	25
8. APE/GPE, MP, and PT Rankings (1-11) based on Mean Ratings Across the K-12 Spectrum Curriculum Content.....	27

LIST OF APPENDICES

APPENDIX	PAGE
A. Cover Letter	45
B. Adapted and General Physical Educators Online Survey.....	47
C. Medical Personnel Online Survey.....	60
D. Physical Therapists Online Survey.....	73
E. Key for Physical Activity Content Areas.....	85
F. Review of Related Literature	88

INTRODUCTION

Traumatic brain injury (TBI) is the leading cause of long-term disability in children and young adults (Katz-Leurer, Rotem, Keren, & Meyer, 2010). An estimated 10 million individuals are affected by TBI worldwide annually, and the World Health Organization estimates that TBI will surpass all other diseases as the major cause of death and disability by 2020 (Archer, 2011). As seen by the high incidence of TBI in the U. S., this acquired disability requires the attention that a serious public health issue demands (National Institute of Health, 1998). Due to advances in medical science the number of individuals surviving TBI is increasing, and therefore the need for well-developed and effective rehabilitation services is on the rise (Driver & Ede, 2009). Given the prevalence of TBI and that the Individuals with Disabilities Education Act (IDEA) mandates physical education as a direct service, specially designed physical education is a unique and ideal environment for students with TBI to receive these services (U.S. Department of Education, 2006). Traditionally, physical education classes are important for introducing new physical activities to improve and maintain health status for school-aged individuals with TBI and as such should be part of the rehabilitation program for students with TBI.

Students with TBI will generally have an Individualized Education Plan (IEP) as a result of needing special education services. This IEP is specially designed to meet the unique learning needs of students and is developed by a team of professionals. Due to the heterogeneity of TBI characteristics one student's IEP may look nothing like another

student's and may involve different recommendations and educational services. These characteristics addressed may include physical, cognitive, and/or affective impairments. This can in turn affect a number of different needs to be addressed within the IEP including attention, cognition, memory, motor abilities, perception, sensory and spatial awareness, and speech. Many students with TBI will have deficits in motor abilities addressed within specially designed physical education. Adapted and general physical educators need to be aware of the specific characteristics that may be presented by students with TBI and choose the most appropriate and meaningful curriculum content for those students.

Physical activity is important for all people but it is critical for individuals with disabilities because it not only improves physical health but also provides emotional, psychosocial, and social benefits (Anderson & Heyne, 2010). It has been shown that increased physical activity is important in the rehabilitation process post TBI as this participation improves quality of life, maintains functional independence, decreases severity of secondary conditions, and reduces health care expenditures (Driver, 2009). Additionally, secondary conditions that often accompany TBI can be caused by immobility, lack of physical activity, lead to decreased aerobic capacity, strength, muscle tone and function, and increased body fat (Driver, O'Connor, Lox, & Rees, 2004). Despite the documented benefits of physical activity participation, regular exercise is not currently used within a multidisciplinary rehabilitation approach for individuals with TBI, leading to low physical activity participation rates (Driver, 2008, Driver, O'Connor, Lox & Rees, 2003).

Additionally, it is a well documented fact that rates of obesity are increasing for the general public while the prevalence of individuals with disabilities who are overweight or obese is reported at an even higher rate than the general population (Rimmer, Rowland, & Yamaki, 2007). When individuals with disabilities, including school-aged individuals with TBI, are overweight or obese they may experience even greater reduction in their functional ability. This can lead to a decrease in their ability to maintain functional independence and physically support their own body weight. Therefore school-aged individuals with TBI can achieve a higher quality of life through physical activity.

Physical activity has beneficial effects on the quality of life for individuals with disabilities. However, individuals with TBI have such a diverse range of disabilities there is no one size fits most motor rehabilitation plan. The main focus of any rehabilitation service for individuals with TBI is the remediation of physical problems. The main goal is to have individuals achieve their optimum level of motor performance post injury (Watson, 2007). Because of the nature of brain injury, damage to any part of the brain may result in motor disorders, possibly including paralysis, spasticity, hypotonia, ataxia, and apraxia (Driver, Rees, O'Connor, & Lox, 2006). Therefore individuals with TBI present a unique challenge of needing rehabilitation programs with physical activities that best serve their specific motor disability needs.

Adapted and general physical education teachers provide unique mediums to address the wide variety of movement needs presented by school-aged individuals with TBI. The physical education setting allows for ample exposure to a variety of physical activities including but not limited to individual and team sports, aquatics, fitness, leisure

participation activities, and so on. What is so unique to the physical education setting is that this physical activity is happening within the social contexts of school. Individuals participating in physical activities in physical education classes are ideally interacting with the other students and are sharing in the development of lifelong beliefs and values about the benefits of the physical activity participation. This social support provided by their peers is critical to the success of any rehabilitation program and plays a central role in buffering the stress caused by the physical, cognitive, and psychosocial effects of the brain injury (Driver, 2005).

For adapted and general physical education programs to address the diverse range of needs presented by students with TBI, the IEP team needs to be made up of an equally diverse group of professionals. Professionals that are especially important for specially designed physical education include the adapted physical educator, general physical educator, physical therapist, and any medical personnel directly involved in the care and rehabilitation of a student with TBI. An integral part of the IEP team should always be the parents, their values, insights, and experiences outside of the school setting cannot be overlooked. These professionals should work as a team to select the best content from the physical education curriculum. As a team there should be appropriate levels of communication and an open dialogue about progress and goals for the student with TBI throughout the school year. In this way these professionals can create a specially designed program that can address an array of motor issues and progress through these issues in the most effective and efficient ways.

In addition to addressing the motor disability characteristics for individuals with TBI adapted and general physical educators, physical therapists, and medical personnel

also need to take into consideration the complex psychological and cognitive effects of the injury. These areas have previously been identified as being difficult to address. The nature and range of physical and cognitive functions that may be impaired by a brain injury are often followed by negative psychosocial experiences (Driver, 2005). However, physical activity has been shown to have a positive effect on psychosocial characteristics in individuals with TBI (Driver & O'Connor, 2003; Driver et. al, 2003). These results have indicated that physical activity has a positive effect on psychosocial states including greater self-esteem, enjoyment, and socialization (Driver, 2005).

The physical education curriculum content priority areas need to positively reinforce affective domain characteristics such as self-esteem, sense of self, social support constructs, and motivation. By understanding the complex psychological aspects that accompany physical activity and adherence to these activities, teachers and rehabilitation professionals that work with school-aged individuals with TBI can increase these behaviors and in turn increase their quality of life. By selecting the most appropriate physical activities with the correct social constructs individuals with TBI will want to seek out various physical activities in the community and have greater participation in their overall recovery.

Despite the wealth of information supporting the use of physical activity that emphasizes psychosocial development for students with TBI there has been little research done on the physical education curriculum content priority areas for these individuals by the professionals who should be involved in the IEP process. Current research has identified many social, health, and physical fitness needs for individuals with TBI but there is no specific data to determine which activities are perceived to be better than

others. Additionally, there is no current research to determine the level of agreement among adapted and general physical educators, physical therapists, and medical personnel on the physical education curriculum content priority areas for students with TBI. The purpose of this study was to compare the physical activity recommendations for individuals with TBI by adapted and general physical educators, medical personnel, and physical therapists to evaluate their perceptions of the physical education content priority areas, the emphasis placed on affective domains areas in the physical education setting, and the level communication among these professionals.

METHODS

Physical activity recommendations were measured by evaluating the ratings of adapted and general physical educators, medical personnel, and physical therapists for physical education content areas via an online survey questionnaire. This survey assessed how much importance these individuals placed on content area as it related to physical activity participation for school-aged individuals with TBI. The study compared what physical education content areas the various groups ranked and rated as most important. Additionally, all three groups priority-ranked and rated five affect domain areas within the physical education setting.

Pilot Study

A pilot study was conducted to establish the content validity and appropriateness of the questions to assess the physical activity recommendations to allow for the results to be generalized to the school-aged TBI population. Additionally, the pilot study was used to refine the directions given for the survey. Sample surveys corresponding to the appropriate subject groups were administered to individuals from each group including two adapted and general physical educators, one physical therapist, and four medical personnel from Gundersen Lutheran Hospital. The adapted and general physical educators stated that the survey had good content, the directions were easy to understand, and only took about 15 minutes to complete. All of the groups were able to easily navigate the online survey and had few if any questions about clarity. The physical therapist appreciated the flow of the study and provided useful ideas about how to contact

other physical therapists in Wisconsin using Cooperative Education Service Agencies (CESA). Of the medical personnel in the pilot study there were two nurse practitioners, one general physician, and one neurologist. These individuals suggested refining questions about current and past caseloads to just current patients because of the high number of individuals they serve. Additionally, they encouraged a more in-depth definition of the type of TBI being addressed and how far along an individual might be in their recovery process. Lastly, the medical personnel stated that they did not distinguish between adapted and general physical educators because they usually just sent a note with the student or the guardian to the school as their main means of communication. The lack of direct communication prompted the idea of adding another question to the survey about how individuals communicated with the other groups, but the research team decided not to make this change in order to keep the survey as simple and quick as possible. Participants from every group stated that it was hard to rank and prioritize the activities and social constructs across the entire K-12 spectrum because of the value and health related benefits of the content areas.

The research team decided to make the following changes to the surveys. All surveys would be prioritized by three different age levels: elementary 3-9 years, middle school 9-14 years, and high school 14-21 years. Additionally, at the beginning of the survey and before the ranking and prioritizing questions a clear definition about the type of TBI and duration of recovery would be indicated. Also, the questions about past work history with students with TBI was removed for both medical personnel and physical therapist because of the difficulty to accurately recall such data. In addition, the idea of a common cover letter, with links to all three types of surveys was purloined from a similar

study. Lastly, all surveys had a comments box added so participants could explain their rankings, priority ratings, and leave a general response if they choose to.

Participants

The study included 193 participants. Of those, 122 (63%) were adapted and/or general physical educators. Ninety (74%) of those individuals had the add-on adapted physical teaching license in either Minnesota or Wisconsin, and 32 (26%) of those individuals were licensed for general physical education. Of the 122 adapted and/or general physical educators 43 (35%) were full-time adapted physical educators, 32 (16%) were full-time general physical educators with 62 (51%) sharing their time between adapted and general physical education. From the 122 adapted and/or general physical educators, 2 (2%) reported that they taught at the preschool or early childhood level, 50 (41%) reported that they taught at the elementary level, 19 (16%) reported that they taught at the middle school level, 23(19%) reported that they taught at the high school level, and 28 (23%) reported that they taught across the K-12 spectrum.

All individuals surveyed had to have previous experience working with at least one individual with moderate to severe TBI as determined by the Glasgow Coma Scale (National Center for Injury Prevention and Disease Control, 2012). General and adapted physical educators had to hold a current teaching license in either Minnesota or Wisconsin. In addition, adapted physical educators needed to hold an add-on adapted certificate, either the Wisconsin 860 (adapted physical education) or the Minnesota 8710.563 (developmental adapted physical education).

There were 20 (10%) medical personnel. Of those individuals 8 (40%) reported being a physician, 3 (15%) reported being a neurologist, 2 (10%) reported being a nurse

practitioner, 2 (10%) reported being a pediatrician, 2 (10%) reported being a pediatric neurologist, and 2 (10%) reported being a physician's assistant. Twelve (60%) reported working in a clinic, five (25%) reported working in a hospital setting, and three reported rotating between both a clinic and hospital setting.

There were 51 (26%) physical therapists. Sixteen (31%) reported working in a school setting full-time, 11 (22%) reported working in a school part time, and 24 (47%) reported working outside of the school setting. Of those working in a school setting, 11 (52%) worked predominantly at the elementary level, two (10%) worked predominantly at the high school level, and eight (38%) worked across the K-12 spectrum.

Procedures

The surveys and research protocols were reviewed and approved by the Institutional Review Board (IRB) for the Protection of Human Subjects at the University of Wisconsin-La Crosse. Surveys were developed, piloted, and refined before being sent to subjects. The format and content for all surveys were adapted from a previous study (Shutt, 2010). Various school-based general and adapted physical educators and physical therapists were contacted via email through statewide databases with an explanation of the purpose of the study and the need for their participation. Additionally, medical personnel were contacted in a similar way but without the use of statewide databases. All participants were encouraged to share the survey with qualified individuals who met the requirements for the study. These emails contained the cover letter and a link to the online survey (see Appendixes A, B, C, & D). The initial paragraph of the survey provided directions for completion and submission. Each group received similar surveys with modifications to make the questions applicable to their specific profession.

The “Physical Education Teacher Priorities of Physical Education Content Areas for Students with Traumatic Brain Injury” (teacher) surveys (see Appendix B) were sent to both adapted and general physical educators on Minnesota and Wisconsin electronic mailing lists. Additionally, professional teaching contacts and other organizations aided this study by providing email addresses and sending emails to professional colleagues that met the requirements of the study. These surveys had different demographic questions than the other groups and questions were worded in such a way as to make them applicable to this group.

The “Medical Personnel Priorities of Physical Education Content Areas for Students with Traumatic Brain Injury” (medical) surveys (see Appendix C) were sent to the medical personnel that are most directly involved with the recovery processes of individuals with TBI. These individuals were contacted with help from local medical professionals who were experts in their fields and provided a list of names, hospitals, and clinics to be contacted that would be interested in the study. These individuals were additionally encouraged to provide the names of other medical professionals that would be interested in the study. The medical surveys had different demographic questions than the other groups and questions were worded in such a way as to make them applicable to this group.

The “Physical Therapist Priorities of Physical Education Content Areas for Students with Traumatic Brain Injury” (PT) surveys (see Appendix D) were sent to physical therapists employed by school districts in Minnesota and Wisconsin. These individuals were located via Cooperative Educational Service Agencies (CESA) across Wisconsin. CESA employs physical therapists that work in local districts and have

connections to many other school physical therapists in the area. These individuals were informed of the purpose of the study and then given the opportunity to provide their email address and have the survey sent to them. Additionally, adapted and general physical educators were asked to forward the survey to physical therapists in their district. The close relationship between adapted physical educators and physical therapists helped greatly to increase the number of participants. Again, the PT surveys had different demographic questions than the other groups and questions were worded in such a way as to make them applicable to this group.

The procedure for all groups was the same. It took participants about 20 minutes to read the email cover letter, navigate to the online survey, read the directions, and complete the survey. The ranking and priority rating sections of the survey contained physical education content priority area and affective domain area definitions. These definitions could be found when the participant held their cursor over the color coded term (see Appendix E). All participants were encouraged to contact the researcher with their questions, comments, or concerns.

Measures

Teacher Survey

The research team created the teacher survey to gather background demographic data, the level of communication between teachers and the other groups, rankings of physical education curriculum content areas, rankings of affective domain areas, ratings of the physical education content areas by age, and ratings of affective domain areas. This survey was created for both adapted and general physical educators with the one difference being that some questions about adapted certification, teaching time, and

communication may not apply to both groups. The first section targeted demographic information such as gender, percent that they taught adapted and general physical education, what level they primarily taught at, if they held an adapted add-on teaching certification in Minnesota or Wisconsin, their history of working with students with TBI, and their current TBI caseload. These questions were asked to insure that individuals participating in the study had enough experience working with students with TBI to make appropriate judgments about physical education priority areas for these individuals.

The second section asked about levels of communication among adapted physical educators, general physical educators, physical therapists, and pertinent medical personnel about students with TBI regarding physical education content. Both groups were asked about communication with other professionals within their field as well. However, they were also given the option to not respond, by citing that the question did not apply to them because it was their profession.

Section three asked adapted and general physical educators to rank order physical education curriculum content areas and affective domain areas. Both questions focused on areas that are important for students with TBI. Teachers ranked the most important areas a 1 and the least important areas an 11 by selecting the terms and dropping them in the correct order. The 11 physical education content categories were Aquatics, Balance and Gait Training, Body and Spatial Awareness, Cardiovascular Endurance, Dance/Movement Therapies, Flexibility, Individual Sports, Muscular Strength and Endurance, Object Control Skills, Team Sports, and Transitioning from School-Based to Community Based Physical Activity. Within the directions was a note that explained how teachers could read a definition of the physical education content

areas. The teachers had to place their cursor over the colored term and hold it there for a moment and the definition would appear in a pop-up text box. These definitions were provided so that all individuals taking the survey had the same information about these content areas. Additionally, teachers ranked five affective domain categories including Perceived Physical Competence, Physical Self-Worth, Self-Esteem, Social Skills in Physical Education, and Social Support. These terms were also accompanied by a pop-up definition.

The fourth section asked teachers to priority rate the 11 physical education content priority areas by three different age cutoffs: elementary 3-9 years, middle school 9-14 years, and high school 13-21 years. This section used screen sliders between 0 (not a priority) and 100 (highest priority), increasing by 1 digit integers. By sliding the bars from one side of the screen to the other, teachers quantitatively indicated the level of importance of that physical education content area for students with TBI in the specified age level. These were the same terms as before and were again accompanied by the option for the definition to appear. Additionally, teachers rated the same five affective domain areas for students with TBI across the entire K-12 spectrum.

Medical Personnel Survey

The medical survey was divided into the same sections as the teacher survey. The first section on demographics differed slightly. This survey asked individuals to identify their specific medical practice area, the facility they work at, and their level of involvement with students with TBI. Like the teacher survey, but unlike the PT survey, the medical survey asked how often they communicated with other medical professionals about students with TBI regarding physical education content. The remainder of the

survey was the same as the teacher survey except the questions were worded so they were applicable to those in the medical profession.

Physical Therapist Survey

The same research team created the PT survey. This survey differed only slightly from the teacher and medical surveys in the following ways. In the first section the survey requested demographic information about the physical therapist's employment within a school district. The second section focused on communication between the physical therapist and other groups but did not ask about communication with other physical therapists as it related to physical education content for students with TBI. The last two sections were identical to the teacher and medical surveys except that the questions were worded so that they were applicable to physical therapists.

Statistical Analysis

This study compared the physical activity recommendations for school-aged individuals with TBI by general and adapted physical educators, medical personnel, and physical therapists. It also evaluated the similarity in the emphasis placed on social constructs in the physical education setting and the level of communication among adapted physical educators, medical personnel, and physical therapists. Statistical analyses were completed using Microsoft Excel 2007 and the Statistical Package for the Social Sciences (IBM SPSS 19.0, Inc., Chicago, IL). Descriptive analysis were used to describe how adapted and general physical educators, medical personnel, and physical therapist differed in their ranking and rating of the physical education content areas and affective domain areas for students with TBI across the K-12 spectrum.

Descriptive statistics were used to get accurate counts for demographic information for the various sub groups, adapted and general physical educators (APE/GPE), medical personnel (MP), and physical therapist (PTs) is SPSS. Counts for frequency of communication between APE/GPE, MP, and PTs were calculated using crosstabs in SPSS. Mean ranking and rating scores from sections three and four on all the Adapted and general physical educators, MP, and PTs surveys were calculated using descriptive statistics in SPSS.

RESULTS

There were 244 respondents; however, only 193 correctly completed the survey. Surveys were eliminated if the person completing it was from a state other than Minnesota or Wisconsin, if they failed to complete the first section of the survey, or if they indicated that they had no previous experience working with individuals with TBI. A total of 122 APE/GPE, 20 MP, and 51 PTs completed usable surveys based on their experience and expertise in the field of TBI. Of those without any TBI experience a total of 26 APE/GPE and six MP completed usable surveys.

Frequency of Communication between APE/GPE, MP, and PTs

Adapted and general physical educators reported the greatest frequency of communication with PTs as once a month (32), with MP once a year (22), with GPE once a week (15), and APE once a year (6). Medical personnel reported the greatest frequency of communication with APE as once a year (6), with PTs as once a year (3), and with GPE both once a week (1) and once a year (1). Physical therapists reported the greatest frequency of communication with APE as once a week (9) and once a year (9), with GPE as once a week (8), and with MP as once a month (7) and once a year (7). The categories of Never (145) and Does Not Apply, I Am Said Professional (90) received the greatest number of responses across all groups. Table 1 presents the frequency of communication.

Table 1. APE/GPE, MP, and PT Frequency of Communication

Participants	Does not apply	Once a week	Once a month	Once a year	Other	Never	Total
APE/GPE							
Talk w/APE	58	4	4	6	2	20	94
Talk w/GPE	22	15	10	11	11	25	94
Talk w/PT	0	7	32	14	17	24	94
Talk w/MP	0	2	9	22	12	49	94
MP							
Talk w/APE	0	0	0	6	12	0	18
Talk w/GPE	3	1	0	1	7	6	18
Talk w/PT	0	0	0	3	4	11	18
PT							
Talk w/APE	5	9	5	9	6	0	34
Talk w/GPE	2	8	5	7	11	0	33
Talk w/MP	0	1	7	7	8	10	33
Total	90	47	72	86	90	145	

Priority Rankings of Curriculum Content

Eighty APE/GPE, 13 MP, and 31 PTs completed the priority rankings of physical education curriculum content areas for school-aged individuals with TBI. The mean rankings for each of the 11 curriculum content areas for APE/GPE, MP, and PTs are shown in Table 2. The ranking scores indicated an inverse relationship with the priority curriculum content areas. The lower the mean ranking, lowest being a 1, the higher the priority area and conversely, the higher the mean ranking, the highest being an 11, the lower the priority area.

Table 2. APE/GPE, MP, and PT Mean Rankings (1-11) on Curriculum Content*

Participants		Aquatics	Balance and Gait Training	Body and Spatial Awareness	Cardiovascular Endurance	Dance/Movement Therapies	Flexibility	Individual Sports	Muscular Strength and Endurance	Object control Skills	Team Sports	Transitioning from School-based to Community based Physical Activity
APE/GPE	n = 80	6	2	3	6	7	6	9	4	6	11	6
MP	n = 13	7	2	2	5	8	6	9	4	6	10	10
PT	n = 31	8	2	3	5	7	6	9	4	6	10	7

*Note: 1 = highest priority, 11 = lowest priority

Results showed that APE/GPE, MP, and PTs ranked balance and gait training and body and spatial awareness as the two highest priorities in the curriculum content areas. The lowest ranked areas by APE/GPE, MP, and PTS were individual and team sports. The rest of the rankings were not as consistent but followed similar patterns. The greatest difference was between MP ranking transitioning from school-based to community based physical activities one of their lowest priorities, a 10, while APE/GPE ranked it a 6 and PT's ranked it a 7.

Priority Rankings of Affective Domain Areas

The same number of APE/GPE (80), MP (13), and PTs (31) completed the priority ranking of the affective domain areas in the physical education setting as ranked the physical activity content areas. The mean rankings for each of the five affective domain areas for APE/GPE, MP, and PTs are shown in Table 3. The rankings scales indicated an inverse relationship with the affective domain areas. As before, the lower the mean ranking, lowest being a 1, the higher the priority area and conversely, the higher the mean ranking, the highest being a 5, the lower the priority area.

Table 3. APE/GPE, MP, and PT Mean Rankings (1-5) on Affective Domain Areas*

Participants		Perceived Physical Competence	Physical Self-Worth	Self-Esteem	Social Skills in Physical Education	Social Support
APE/GPE	n = 80	3	3	2	4	4
MP	n = 13	4	3	2	4	3
PT	n = 31	2	2	2	4	4

*Note: 1 = highest priority, 5 = lowest priority

Results showed that all three groups ranked self-esteem the highest and social skills in physical education the lowest. Other than these two affective domain areas there were no other categories that were ranked consistently across all of the groups.

Priority Ratings of Curriculum Content

Forty-eight APE/GPE, 7 MP, and 21 PTs completed the ratings of the curriculum content areas. These rating scales were divided into three subcategories by age of the individual with TBI. The first category was elementary, ages 3-9 years, middle school, ages 10-14 years, and high school, ages 15-21 years. Adapted and general physical educators, MP, and PTs rated the 11 curriculum content areas based on the needs of individuals with TBI at that particular age level. Each rating is based on a scale from 0 to 100, with 0 being the lowest priority and 100 being the highest priority. The mean ratings for elementary aged individuals by APE/GPE, MP, and PTs are shown in Table 4.

Table 4. APE/GPE, MP, and PT Mean Ratings (0-100) on Elementary Curriculum Content*

Participants		Aquatics	Balance and Gait Training	Body and Spatial Awareness	Cardiovascular Endurance	Dance/Movement Therapies	Flexibility	Individual Sports	Muscular Strength and Endurance	Object control Skills	Team Sports	Transitioning from School-based to Community based Physical Activity
APE/GPE	n = 48	55	85	82	59	59	64	43	71	68	27	46
MP	n = 7	38	86	90	63	36	66	18	64	69	13	23
PT	n = 21	49	86	87	71	59	75	47	80	75	40	48

*Note: 100 = highest priority, 0 = lowest priority

The mean ratings had a positive relationship with the priority level of each curriculum content area, therefore the higher the rating, the higher the level of importance. All three groups, APE/GPE, MP, and PTs rated balance and gait training and body and spatial awareness as the highest elementary curriculum content areas. Additionally, all three groups, APE/GPE, MP, and PTs, rated team sports, individual sports, and transitioning from school-based to community based physical activity as the lowest elementary content areas. Overall MP tended to rate the content areas lower than any other group, while APE/GPE and PTs tended to rate content areas the same. Additionally, all respondents placed more emphasis on typically developing motor skills instead of sport focused game play and is to be expected at elementary grade level.

The same relationship between high ratings and importance applied to the middle school curriculum content ratings. The data for the middle school ratings demonstrated a slight change in the general physical education content. Table 5 shows the mean ratings for middle school-aged individuals by APE/GPE, MP, and PTs.

Table 5. APE/GPE, MP, and PT Mean Ratings (0-100) on Middle School Curriculum Content*

Participants		Aquatics	Balance and Gait Training	Body and Spatial Awareness	Cardiovascular Endurance	Dance/Movement Therapies	Flexibility	Individual Sports	Muscular Strength and Endurance	Object control Skills	Team Sports	Transitioning from School-based to Community based Physical Activity
APE/GPE	n = 48	60	74	74	69	55	63	60	75	68	43	70
MP	n = 7	38	83	86	69	31	68	27	72	64	32	35
PT	n = 21	49	83	89	82	55	73	62	82	70	57	69

*Note: 100 = highest priority, 0 = lowest priority

Again, there is a high level of agreement between APE/GPE, MP, and PTs on the middle school content areas. It is interesting to note that the ratings of the APE/GPE and PTs are so closely aligned. Another interesting point is the much lower ratings by MP on dance and movement therapies, individual sports, and transitioning from school-based to community based physical activity content areas.

The ratings of the high school curriculum content areas also demonstrated a slight change in the general physical education curriculum. This is noted by the greater emphasis placed on individual and lifelong fitness activities. Of particular importance is the difference in ratings by APE/GPE and PTs to those of the MP on physical activities

that relate to transitioning from school-based to community based activities. Table 6 shows the mean ratings for high school-aged individuals by APE/GPE, MP, and PTs.

The top curriculum content areas for this grade level are again balance and gait training and body and spatial awareness, but two other content areas, muscular strength and endurance and cardiovascular endurance, are almost as highly rated. Additionally, the drastic differences between MP rankings of aquatics, dance and movement therapies, and individual sports are again illustrated. Adapted and general physical educators and PTs rated transitioning from school-based to community based physical activity the highest of all the categories for this grade level.

Table 6. APE/GPE, MP, and PT Mean Ratings (0-100) on High School Curriculum Content*

Participants		Aquatics	Balance and Gait Training	Body and Spatial Awareness	Cardiovascular Endurance	Dance/Movement Therapies	Flexibility	Individual Sports	Muscular Strength and Endurance	Object control Skills	Team Sports	Transitioning from School-based to Community based Physical Activity
APE/GPE	n = 48	65	68	68	71	53	66	62	78	66	46	90
MP	n = 7	39	86	81	73	31	66	35	76	64	44	47
PT	n = 21	56	74	77	79	49	71	68	80	64	57	88

*Note: 100 = highest priority, 0 = lowest priority

Priority Ratings of Affective Domain Areas

The same number of APE/GPE (48), MP (7), and PTs (21) completed the scaled ratings of the affective domain areas in the physical education setting. Adapted and general physical educators, MP, and PTs were asked to consider the five affective domain characteristics across the entire K-12 spectrum for individuals with TBI. The mean ratings for each of the five affective domain areas for APE/GPE, MP, and PTs are shown in Table 7. The ratings scales indicated a positive relationship with the affective domain areas. As before, the lower the mean rating, lowest being a 0, the lower the priority area and the higher the mean rating, the highest being 100, the higher the priority area.

Table 7. APE/GPE, MP, and PT Mean Ratings (1-5) on Affective Domain Areas*

Participants		Perceived Physical Competence	Physical Self-Worth	Self-Esteem	Social Skills in Physical Education	Social Support
APE/GPE	n = 48	73	83	86	75	77
MP	n = 7	61	80	90	57	66
PT	n = 21	81	87	87	80	83

*Note: 1 = highest priority, 5 = lowest priority

It is interesting to note that both APE/GPE and PTs value the affective domain areas overall at a greater priority level than the MP. But all three groups tended to value self-esteem as the most important area. Overall all categories were rated fairly high, with the lowest mean rating being a 57 for social skills in physical education by MP. The two lowest ranked areas for all three groups were perceived physical competence and social skills in physical education.

Rankings from Ratings for Curriculum Content

Table 8 presents a summary of all the data presented for the three groups across all of the different grade levels and including all 11 of the curriculum content areas. In this table the ratings have been converted to rankings, so that the highest rated content area (100) are the highest ranked content area (1). Only one ranking can be assigned a content area, therefore the rankings go from 1-11 with no repeats. This forces the content areas into an order that is more easily understood. Additionally, this table lists the original mean rank order the respective groups selected before respondents prioritized the categories by grade level. In this table there is an inverse relationship between the rank and the priority level. As with the original rankings, the lower the mean ranking, lowest being a 1, the higher the priority area and conversely, the higher the mean ranking, the highest being an 11, the lower the priority area.

Table 8. APE/GPE, MP, and PT Rankings (1-11) based on Mean Ratings Across the K-12 Spectrum Curriculum Content*

Participants	Aquatics	Balance and Gait Training	Body and Spatial Awareness	Cardiovascular Endurance	Dance/Movement Therapies	Flexibility	Individual Sports	Muscular Strength and Endurance	Object control Skills	Team Sports	Transitioning from School-based to Community based Physical Activity
APE/GPE											
Rank	6	1	2	4	9	5	10	3	7	11	8
Elementary	8	1	2	7	6	5	10	3	4	11	9
Middle School	8	2	3	5	10	7	9	1	6	11	4
High School	8	4	5	3	10	6	9	2	7	11	1
MP											
Rank	7	1	2	4	8	5	9	3	6	11	10
Elementary	7	2	1	6	8	4	10	5	3	11	9
Middle School	7	2	1	4	10	5	11	3	6	9	8
High School	9	1	2	4	11	5	10	3	6	8	7
PT											
Original Rank	9	1	2	4	8	5	10	3	6	11	7
Elementary	8	2	1	6	7	4	10	3	5	11	9
Middle School	11	2	1	3	10	5	8	4	6	9	7
High School	10	5	4	3	11	6	7	2	8	9	1

*Note: 1 = highest priority, 11 = lowest priority

DISCUSSION

The purpose of this study was to compare the physical education content priorities for school-aged individuals with TBI by adapted and general physical educators (APE/GPE), medical personnel (MP), and physical therapists (PTs) to evaluate their perceptions of the physical education content priority areas and the emphasis placed on affective domain areas in the physical education setting. Additionally, this study compared the frequency of communication among APE/GPE, MP, and PTs as it related to the physical education participation of school-aged individuals with TBI.

Results for communication indicated that APE/GPE and PTs reported communicating with APE, GPE, MP, and PTs at least once a week at the highest frequencies, while MP reported communicating with APE, GPE, and PTs at least once a year at the highest frequencies. The greatest majority of respondents indicated that they communicated with APE, GPE, MP and PTs at other intervals. For example a common comment from MP was that they sent a note with the student or parent to go to the school and never directly communicated with the APE or GPE. Additionally, the category of Never was selected the most by all three groups, indicating that there is a lack of communication in the way that information is shared from one professional to another. There is a possibility that the lack of communication between MP and APE/GPE and PTs about physical activity can be attributed to an overlap of services, a lack of services, or inappropriate services in some content areas.

One solution would be to clearly define acceptable communication mechanisms and to regularly schedule collaboration with key professionals. Medical personnel may think sending a note with a parent constitutes communication, while APE/GPE may feel in person meetings are most beneficial. Additionally, PTs and APE/GPE may not count a brief conversation while passing in the hallway as true communication. All three groups need to agree on what constitutes communication and what is the best way to communicate whether by phone, email, letter, or in person. Additionally, requiring communication between all groups at specific intervals may help. Possible options could be at least once a semester or every time the student visits their primary care provider related to TBI. By defining what constitutes communication and clearly setting specific points when this communication will occur, APE/GPE, MP, and PTs will engage in more frequent and meaningful communication. This should result in a more effective “motor team” approach to address development needs for students with TBI.

In addition to agreement on frequency and quality of communication, APE/GPE, MP, and PTs should agree on the physical education curriculum content areas for school-aged individuals with TBI. Interestingly the initial rankings across the entire K-12 spectrum appeared to be consistent across all three groups. The top curriculum content areas were balance and gait training, body and spatial awareness, and muscular strength and endurance for all three groups. It can be concluded that these are the top priorities for school-aged individuals with TBI. This is no surprise considering the typical motor performance concerns for individuals with TBI. What is surprising was the agreement on the lowest priorities. All three groups ranked individual and team sports as the two lowest

priorities. However, these content areas tend to make up most of the curriculum content for school-based general physical education classes.

When ratings were converted to rankings and analyzed by grade level more differences became apparent. This is most easily seen in Table 8. The two consistently top ranked areas were balance and gait training and body and spatial awareness. These are two areas that receive much attention for individuals with TBI as soon as they begin the rehabilitation process. It is interesting to note that these content areas were ranked lower as the individual with TBI progressed to a higher grade level for APE/GPE and PTs. Medical personnel kept these two content areas as their top two choices regardless of grade level. This indicates that these areas should be focused on throughout the physical education curriculum. Additionally, MP may not fully understand how physical education content is expected to change based on grade level.

The next content area receiving the highest ranking was muscular strength and endurance. This is an extremely important area for individuals with TBI as they need to develop strength in different muscle groups to facilitate new adaptive movement patterns depending on their injury. The category increased its prioritization for APE/GPE as individuals progressed to a higher grade level for middle and high school-aged students. Physical therapists also increased their prioritization for high school-aged students. This reflects the importance of this content area and the need to use these skills at the developmentally appropriate time.

Cardiovascular endurance was the next content area receiving a mid-level ranking of a fourth. This area fluctuated more than the previous content areas. Initially, when ranking across the K-12 spectrum all the groups ranked this area fourth. However, when

grade level was factored in the ranking of this content area began to fluctuate. Adapted and general physical educators ranked this the area the lowest for elementary aged students with TBI, then middle school, and the highest for high school-aged students with TBI. This shows that as students age APE/GPE place a greater emphasis on cardiovascular endurance, and value this as a more important skill as these individuals transition into adulthood. Medical personnel and PTs both ranked this content area lower for elementary aged individuals with TBI but then increased it to the same ranking for middle and high school aged students. Thus there is a greater importance placed on this content area because both MP and PTs value these kinds of physical activities at a younger age for individuals with TBI than APE/GPE, possibly because of the long term health related benefits tied to high levels of cardiovascular endurance.

The next content area receiving a mid level ranking was flexibility. Adapted and general physical educators ranked this the lowest of the three groups. This lower ranking could reflect the lack of time, availability of appropriate equipment, or expertise in this area. Physical therapists ranked this area as most important for elementary aged individuals, then middle school, and lowest for high school-aged individuals. Medical personnel consistently ranked this as a mid-level priority for individuals with TBI across all grade levels. The differences in rankings based on grade level reflect a difference in factors the three different groups are considering when ranking and rating the content areas. Medical personnel are most likely considering the long term health and quality of life issues facing individuals with TBI, while PTs are considering health issues and a remediation of movement issues, and APE/GPE are considering the typical curriculum for physical education across the K-12 spectrum, the general needs of individuals with

TBI, and the amount of time and space available. This difference of factors is most likely to explain the difference in rankings from this point on.

It is also important to distinguish between the different roles the three professional groups play as part of a “motor team” approach to address physical activity needs for students with TBI. Specifically, it is important to note that APE/GPE are not working to remediate movement problems for students with TBI. Instead they are working to educate students with TBI about different types of physical activities and adapt activities and equipment to fit the needs of the student to allow them to be successful in the physical education setting. Additionally, these individuals are working to teach students to independently develop lifelong health and fitness habits that can be applied to other settings outside of school. However, PTs are generally working towards goals that remediate specific movement concerns in a clinical or school-based setting. Therefore the physical activities of most physical therapies are limited to those of daily living, such as gait training, balance, and core stability. Medical personnel are most concerned with the overall health of students with TBI and as such are more likely to prescribe physical activity limitations and provide timelines to return to activity rather than remediate specific movement concerns. Even though all three professional groups are trained to focus on different areas, it is important that there is a true “motor team” approach so that students with TBI can benefit from all of their areas of expertise. This is especially important for APE/GPE and PTs because of their common collaboration in the public school special education setting. This collaboration is evident in the high levels of agreement APE/GPE and PTs had on most physical education curriculum content areas.

Adapted and general physical educators and PTs ranked transitioning from school-based to community base physical activity as their next highest content area. This reflects the high level importance placed on this particular area in the Individualized Education Plan (IEP) process. Both of these groups spend a great deal of time creating specially designed physical education for individuals that qualify, especially the APE. The PTs are most directly involved with the IEP in the form of related services which a student with TBI is likely to need. It is interesting that MP rated this category so low, with an average ranking of 8. This shows that while MP want physical activity skills to be generalized to areas outside of the physical education environment so individuals can continue to be physically active throughout their adult lives, MP may place a greater emphasis on learning the actual skill than transitioning these skills. This could be due to a lack of understanding on the part of MP on the actual transition process of skills learned in a school, clinic, or hospital setting to the real world.

Object control skills were ranked the next highest, on average 7, by both APE/GPE and PTs, while MP on average ranked this content area a 6. This area focuses on manipulating objects in one's environment and includes tasks such as throwing, catching, dribbling, and kicking. It is interesting that this content area is ranked considerably higher than the categories of individual and team sports, especially because it is the object control skills that fundamentally contribute to those content areas. It is no surprise that this content area is ranked lower than the previous content areas considering the importance of remediating mobility issues commonly seen in individuals with TBI.

The next highest content area is aquatics. Bearing in mind the vast array of options for aquatics programming, the proven benefits for individuals with TBI in an

aquatics environment, and the health benefits of aquatic activities it is extremely surprising how low this area was ranked. This could possibly be because individuals ranking this category thought of it only in terms of swimming laps or developing water safety skills and did not consider the wide variety of options such as water jogging or working on gait patterns that are available in an aquatics environment. Another reason for the low ranking could be because of lack of access to quality aquatics facilities. Few hospitals and clinics have access to therapeutic pools and even fewer schools have pools that can be relied on to be both working and at an appropriate temperature. It is unfortunate that this content area is ranked so low considering the myriad of physical activity options it provides.

Dance and movement therapies were on average ranked ninth. It did receive higher rankings by APE/GPE and PTs for the elementary aged individuals with TBI but dropped to lower rankings as respondents considered middle and high school grade levels. Dance has recently increased in popularity in the last few years, as seen by the recent increase in dance video games like Dance, Dance Revolution or Zumba Dance Fitness, and new dance game shows like So You Think You Can Dance or America's Best Dance Crew, and is gaining traction with all generations. However, it could be this narrow view of dance as performance and not dance as fitness, rhythmic movement patterns, or a mind body connection as it is intended as a movement therapy that contributed to the lower rankings. Additionally, dance and movement therapies may not be a physical activity that the groups were familiar with but it did receive higher ratings than the more conventional sport content areas.

Individual and team sports consistently received the two lowest rankings across all three groups. Individual sports predominately fluctuated between rankings of 9 and 10. While APE/GPE consistently ranked team sports eleventh across the entire K-12 spectrum and when the grade levels were considered individually. The fact that all three groups did not see a benefit to these two content areas points to a glaring flaw in the current physical education curriculum. Considering that individual and team sports dominant most physical education curricula from middle school through high school and that on average all of the professionals involved in the study ranked these two areas as the lowest priority areas strongly suggests that a critical analysis of physical education curriculum is necessary. It also suggests that if this is the curriculum for the general population that school-aged individuals with TBI would not be best served in the general physical education environment and would instead be better suited in an adapted physical education setting where their specific physical activity needs could be met. This is the advantage of the IEP process where the students individual needs can be met.

Lastly the rankings and ratings of the affective domain areas showed that there was a greater emphasis placed on self-esteem and physical self-worth for all three groups. This is especially important for school-aged individuals with TBI because as they begin to participate in physical activities post injury they have to reconstruct their feelings of self-worth and value as it relates to their physical performance of skills. All three groups ranked Perceived Physical Competence, Social Skills in Physical Education, and Social Support as lower priority areas. However, the first time school-aged individuals attempt physical activities after rehabilitation it is essential that they have a positive experience. If the student feels that their ability to complete the skill is diminished they

will be less likely to participate in physical activity. Additionally, if a student with TBI no longer values physical activity because it makes them feel bad about themselves, they may stop participating in physical activity all together. This lack of physical activity participation could lead to secondary conditions further complicating their disability. Thus it is extremely important to make sure that the individuals involved in developing specially designed physical education create the greatest benefit by understanding these affective domain areas. These are very important areas for continued physical activity participation among school-aged individuals with TBI. They also need to fully understand the effects of large class, small group, or individual pull-out instructional models and how each will affect the students self-perception.

Anecdotally, it was interesting to review the comments provided by APE/GPE, MP and PTs as it related to their frequency of communication as well as rankings and ratings of affective and physical education curriculum content areas. The comments provided by these individuals highlighted the differences in the priority rankings and ratings of all three groups. Additionally, these comments provided insights into individuals' rationale as to why they ranked and rated the affective and physical education content areas as they did.

Adapted and general physical educators commonly stated that level of communication depended on the student with TBI. If they required more frequent communication, then APE/GPE made sure it happened; if they needed less, then APE/GPE talked less. Interestingly, a few APE/GPE stated that school PTs were their conduit to MP or they simply read the medical reports to access the information they needed. Additionally, a few APE/GPE reported that ranking by age level was difficult

because their physical activity recommendations would have varied based on the age of the student at the time of the injury. For example, a student may be in the eleventh grade, but if they sustained the brain injury at age 4 their priority ratings of physical education content areas would be different than if the student sustained the brain injury at 15. Lastly, many APE/GPE stressed that students with TBI present an array of characteristics and their motor development is only one part of the entire person. Therefore, it is extremely important to look at the whole student and include the family in the “motor team” as well.

Medical personnel stated that they communicated mostly through the use of notes. This including sending a note with a parent, filling out a school’s form, and sharing information with other MP by adding notes to the student’s file. They also indicated that the communication was specific to physical education activity restrictions and as such may only be written once or twice a year. Medical personnel also explained that they did not have much expertise in the area of physical education. One particular individual explained their low ranking by stating that although sports are important, students with TBI need skills and habits to keep them healthy long term. Therefore, impaired decision making skills that often accompany TBI make team sports very challenging and may not be the best physical activity content areas for these students.

Physical therapists reported that their communication with APE/GPE depended on the needs of the student and the level of involvement of the APE/GPE. Some PTs reported that they assisted with physical education instruction with the APE and therefore communicated very frequently. Others reported that there was no APE teacher for their district and only rarely communicated with the GPE. It is interesting to note that while

APE/GPE reported that they used PTs as the main conduit for communicating with MP, PTs reported very little communication with MP, though some PTs did state that they communicated with the family about medical concerns.

Of particular interest were the PTs comments on the physical education content areas. Physical therapists valued previous life experience as the biggest factor for determining the best physical education content areas for that student. For example, the older a student gets, the more previous life experience should be taken into account, if the student previously found great enjoyment in team sports, than this content area should be rated as a higher priority. However, if the student was more sedentary, then cardiovascular endurance or transitioning to community based exercise program should be a higher priority than team sports. Additionally, PTs stated that regaining lost motor function is a high priority, but it is more important that the students feel competent and confident in their motor abilities so that physical activity is desired and not avoided. Just as the APE/GPE, PTs stated that the age at the time of brain injury was another important factor in determining the best physical education content areas; they also stated that the severity of the brain injury played an important part in determining the top content areas. Also, PTs stated that they wanted to recommend the aquatics area but were unable to because of the lack of access to facilities. Lastly, PTs stated that the foundation of balance and gait training, body and spatial awareness, and muscular strength are important for getting students with TBI back to a prior level of functioning. From this perspective, these are the areas that help to get students back to participating in their schools and communities.

All of the comments provided by APE/GPE, MP, and PTs help to shed more light on the reasoning behind their rankings and ratings. Overall, it is important to evaluate the child as a whole, by considering their age at time of the injury, the severity of the injury, and the personal preferences of the student prior to injury, and to include the family in the decision making process as needed. It is equally important to remember that APE/GPE, MP, and PTs bring expertise from different backgrounds and have different roles and responsibilities. It is only by communicating and sharing their knowledge with the whole “motor team” and factoring all the individual facets that make up that particular student, that APE/GPE, MP, and PTs can select the best physical education content areas for students with TBI.

CONCLUSION

Communication among APE/GPE, MP, and PTs is imperative to ensure that students with TBI receive the best possible specially designed physical education program. Discussion about the type of physical activity, the intensity, and the content areas that best suits these students should happen at least once a semester. In schools, the IEP team, including physical education teachers, should take the lead to best serve students with TBI. All parties should be clear on what constitutes communication and what is the best way to actually convey a message whether it be through a note, an email, or a quick phone call. There may be differences of opinion on what is the best content area but between the adapted physical education, general physical education, and the physical therapy settings, all of the movement issues school-aged individuals with TBI present should be readily addressed. Each content area may not cover the same physical activities in the same amount of detail by APE/GPE, MP, and PTs, but there should be enough consistency to reinforce the transitioning of physical activity skills from the school, clinic, or rehabilitation setting to the real world. Lastly, there should be a better understanding by all of the groups that a student's ability to transfer what is learned in the adapted physical education, general physical education, hospital or clinic, and therapy settings to the real world is needed to ensure lifelong participation in physical activities. It is only by encouraging and teaching the skills necessary to guarantee lifelong physical activity participation that the health benefits of physical activity become an expectation for school-aged individuals with TBI.

Additionally, the content areas that are the highest priority for APE/GPE, MP, and PTs are not the same content areas that are traditionally taught within the general physical education setting. Perhaps, specially designed physical education curriculum would be best to meet the unique needs of school-aged individuals with TBI. This would include APE/GPE and PTs working to explore ways to incorporate more balance and gait training and body and spatial awareness physical activities into the physical education curriculum to better accommodate school-aged individuals with TBI. Medical personnel may benefit from a more in depth explanation on the importance of transitioning from school-based to community based physical activity from APE/GPE and PTS. In this way, MP can better understand what is actually being taken away from the physical activities they are recommending for school-aged individuals with TBI. And therefore, better understand the amount of time it takes to successfully transition a skill from one setting to another.

Lastly, APE/GPE, MP, and PTs need to better understand the effects certain physical activity content areas have on the five affective domains for school-aged individuals with TBI. By selecting activities that can build on these domain areas they can positively reinforce physical activity participation. This reinforcement of physical activity via the affective domain areas will increase the individual's enjoyment of the physical activity and lead to greater participation. This increase in participation will allow the student more opportunities to practice certain skills and ideally lead to remediation of certain motor issues. Ultimately, it is through the use of the best physical education curriculum content designed with the appropriate affective supports that the quality of life of school-aged individuals with TBI can be increased.

Further research should be done to determine the physical activity content areas that remediate movement issues for school-aged individuals with TBI. The area of aquatics should be explicitly explored to see if the benefits adults with TBI have experienced equally benefit school-aged individuals with TBI. Additionally, more research needs to be done to determine the best ways to boost school-aged individual's sense-of-self by evaluating the effects of the various physical activity content areas on the affective domains. Further research should be done to explore how communication is taking place among APE/GPE, MP, and PTs and what content is actually being discussed. It would be equally important to determine if increased communication translates to improved services and better performance of skills in the physical education setting. Lastly, it would be important to explore the opinions of parents as it relates to physical activity recommendations for their school-aged child with TBI and their beliefs regarding the benefit of physical activity participation and evaluate if this has any impact on the progress of motor skill development.

REFERENCES

- Anderson, L., & Heyne, L. (2010). Physical activity for children and adults with disabilities: An issue of “amplified” importance. *Disability Health Journal*, 3, 71-73.
- Archer, T. (2011). Influence of physical exercise on traumatic brain injury deficits: Scaffolding effect. *Neurotox Res*, Advanced online publication. Doi:10.1007/s12640-011-9297-0
- Driver, S. (2005) Social support and the physical activity behaviours of people with a brain injury. *Brain Injury*, 19(13), 1067-1075.
- Driver, S. (2009). What barriers to physical activity do outpatients with a traumatic brain injury face? *Journal of Cognitive Rehabilitation*, 27(3), 4-10.
- Driver, S., & Ede, A. (2009). Impact of physical activity on mood after TBI. *Brain Injury*, 23(3), 203-212.
- Driver, S., & O'Connor, J. (2003) Exercise participation, self-esteem, and affective experiences of people with a brain injury. *Journal of Cognitive Rehabilitation*, 21(2), 26-33
- Driver, S., O'Connor, J., Lox, C., & Rees, K. (2003). Effect of an aquatics program on psycho/social experiences of individuals with brain injuries: A pilot study. *Journal of Cognitive Rehabilitation*, 21(1), 22-31.
- Driver, S., O'Connor, J., Lox, C., & Rees, K. (2004). Evaluation of an aquatics programme on fitness parameters of individuals with a brain injury. *Brain Injury*, 18(9), 847-859.
- Driver, S., Rees, K., O'Connor, J., & Lox, C. (2006) Aquatics, health-promoting self-care behaviours and adults with brain injuries. *Brain Injury*, 20(2), 133-141.
- IBM Statistical Programming for Social Sciences (Version 19) [Computer Software]. Chicago, IL; IBM Company Headquarters
- Katz-Leurer, M., Rotem, H., Keren, O., & Meyer, S. (2010). Recreational physical activities among children with a history of severe traumatic brain injury. *Brain Injury*, 24(13/14), 1561-1567. doi:10.3109/02699052.2010.52304
- National Center for Injury Prevention and Disease Control. Centers for Disease Control and Prevention. <http://www.cdc.gov/masstrauma/resources/gcs.pdf>. Accessed July 1, 2012.

- National Institute of Health (1998) *Rehabilitation of person's with traumatic brain injury*. NIH Consensus Statement, Oct 26-28; 16, 1-4.
- Rimmer, J., Rowland, J., & Yamaki, K. (2007) Obesity and secondary conditions in adolescent with disabilities: Addressing the needs of an underserved population. *Journal of Adolescent Health*. 224-229.
- Shutt, M. (2010) A comparison of physical education content priorities of teachers and parents of children with Down syndrome. (Master's thesis, University of Wisconsin – La Crosse).
- U.S. Department of Education – Office of Special Education and Rehabilitative Services (2006). 34 CFR 300 and 301 - Assistance to States for the Education of Children With Disabilities and Preschool Grants for Children With Disabilities; Final Rule. Part II. Federal Register (Monday, August 14, 2006).
- Watson, M. J. (2007) Feasibility of further motor recovery in patients undergoing physiotherapy more than 6 months after severe traumatic brain injury: An updated literature review. *Physical Therapy Review*, 12, 21-32.

APPENDIX A
COVER LETTER

Dear Adapted and General Physical Educators, Physical Therapists, and Medical Personnel:

I am a graduate student studying adapted physical education at the University of Wisconsin-La Crosse. I am conducting a study to compare the physical education program content priorities of adapted physical educators (APE), general physical educators (GPE), physical therapists, and medical personnel, and their perception of physical activity on affective domain characteristics **for students with traumatic brain injury (TBI)**.

Your assistance is needed with this study. Your extensive knowledge of student's with TBI can contribute significantly to this work. The survey should only take 15-20 minutes, and will ask you to rank and prioritize physical education content areas and social constructs for students with TBI. We encourage participants to send this letter to any individuals that may be able to assist with this study. Please click on the appropriate link to begin the survey:

APE/GPE Survey [[Click here to begin survey](#)]
Medical Personnel Survey [[Click here to begin survey](#)]
Physical Therapist Survey [[Click here to begin survey](#)]

Participation is completely voluntary and you may choose not to answer certain questions. Submission of the survey conveys your informed consent. The completed surveys will be anonymous, and your identity and the identity of your employer will not be known by anyone. All surveys will be password protected and destroyed after data analysis. This research project has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects at the University of Wisconsin-La Crosse.

We appreciate your time and thank you for your assistance. If you have questions regarding the survey, please contact me at the Center on Disability Health and Adapted Physical Activity ([517-927-2140](tel:517-927-2140), siebert.erin@uwlax.edu) or contact Dr. Garth Tymeson at [608-785-5415](tel:608-785-5415).

Sincerely,

Erin Siebert, Graduate Student
Adapted Physical Education

Garth Tymeson, Ph. D., Professor
Adapted Physical Education

APPENDIX B
ADAPTED AND GENERAL PHYSICAL EDUCATORS
ONLINE SURVEY

Physical Education Teacher Priorities of Physical Education Content Areas for Students with Traumatic Brain Injury

Thank you for participating in our study about physical education curriculum content for students with **Traumatic Brain Injury**. Your participation should take about 10 – 15 minutes. All of the information you submit will be anonymous and only group data will be used in publications or presentations. By clicking the "submit" button at the end of the survey, you are giving your informed consent to participate in this study. Again, thank you for your time and valuable information.

Survey Completion
0% 100%

>>

Gender:

- ☐ Male
☐ Female

In which state do you currently teach?

- ☐ Minnesota
☐ Wisconsin
☐ Other (please specify)

In which state do you hold an adapted physical education credential?

- ☐ Minnesota 8710.53 (Developmental/ Adapted Physical Education)
☐ Wisconsin 860 (Adapted Physical Education)
☐ I do not have an adapted physical education credential

What percent full-time equivalent (FTE) do you currently teach **general physical education (GPE)**?

- ☐ 0-15%
☐ 16-30%
☐ 31-45%
☐ 46-60%
☐ 61-75%
☐ 75-100%

What percent full-time equivalent (FTE) do you currently teach **adapted physical education (APE)**?

- ☐ 0-15%
- ☐ 16-30%
- ☐ 31-45%
- ☐ 46-60%
- ☐ 61-75%
- ☐ 75-100%

At what level do you primarily teach?

- ☐ Preschool
- ☐ Elementary
- ☐ Middle
- ☐ High School
- ☐ K - 12
- ☐ Other (Please specify)

How many students with Traumatic Brain Injury (TBI) do you **currently** have on your case load?


- ☐ 1-2
- ☐ 3-5
- ☐ 6-8
- ☐ More than 8 (please specify)

- ☐ I do not currently have student with TBI on my case load

How many students with Traumatic Brain Injury (TBI) **have you taught** in your teaching career?

- ☐ 1-5
- ☐ 5-10
- ☐ 10-15
- ☐ More than 15 (please specify)

- ☐ I have not taught students with TBI

Survey Completion
0%  100%



How frequently do you communicate with **adapted physical educators (APE)** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Does not apply - I am an Adapted Physical Educator
- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☒ Other (Please specify)
-
- ☐ Never

How frequently do you communicate with **general physical educators (GPE)** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Does not apply - I am a General Physical Educator
- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (Please specify)
-
- ☐ Never

How frequently do you communicate with the **school district's physical therapist** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (Please specify)
-
- ☐ Never

How frequently do you communicate with **non-school medical personnel** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (Please specify)
- ☐ Never

Survey Completion
0% 100%



The following questions apply to individuals with **MODERATE to SEVERE** Traumatic Brain Injury, as measured by the Glasgow Coma Scale, at least one year post-injury. Someone with moderate TBI generally receives a score of 9–12 on the GCS, while someone with severe TBI receives a score of 8 or below. This survey is NOT asking about concussions or post-concussive syndrome.

Click and drag the content area to your preferred ranking as listed on the right hand side to rank order the following physical education content areas from the most to least important for students with TBI. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "11" for the least important. Your ranking of content areas should be for students with TBI across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Aquatics	1
Balance and gait training	2
Body and spatial awareness	3
Cardiovascular endurance	4
Dance and movement therapies	5
Flexibility	6
Individual sports	7
Muscular strength and endurance	8
Object control skills	9
Team sports	10
Transitioning from school-based to community based physical activity	11

Click and drag the social aspect to your preferred ranking as listed on the right hand side to rank order the following social aspects within physical education from the most to least important for students with Traumatic Brain Injury. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "5" for the least important. Your ranking of social domain areas should be for students with Traumatic Brain Injury across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Perceived Physical Competence	1
Physical Self-Worth	2
Self-Esteem	3
Social Skills in Physical Education	4
Social Support	5

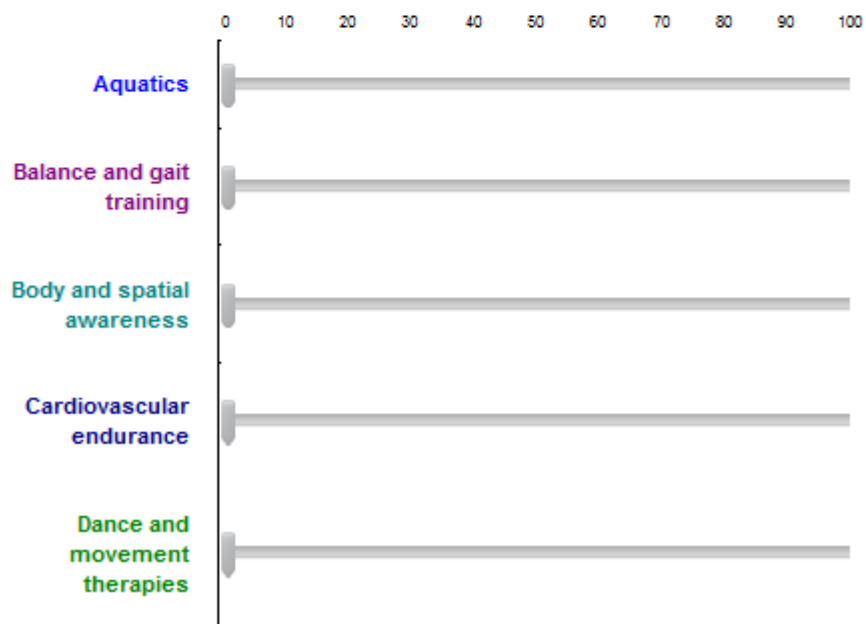


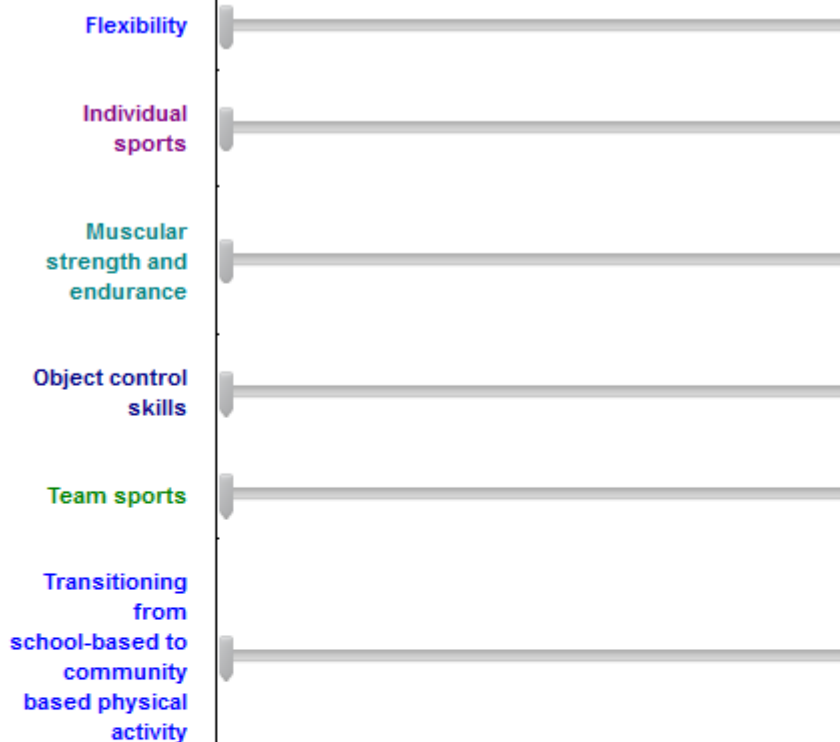
Below are 3 sections to prioritize physical education content areas by age and grade level. Beside each category is a scale for prioritizing the specific content area. Please consider each content area as it relates to students with Traumatic Brain Injury and their future development of skills and knowledge. Your prioritizing of content areas should be for students with Traumatic Brain Injury according to their age and grade range.

Note: a low priority is a 0 while the highest priority is 100.

****Place your cursor over the colored term for the definition.**

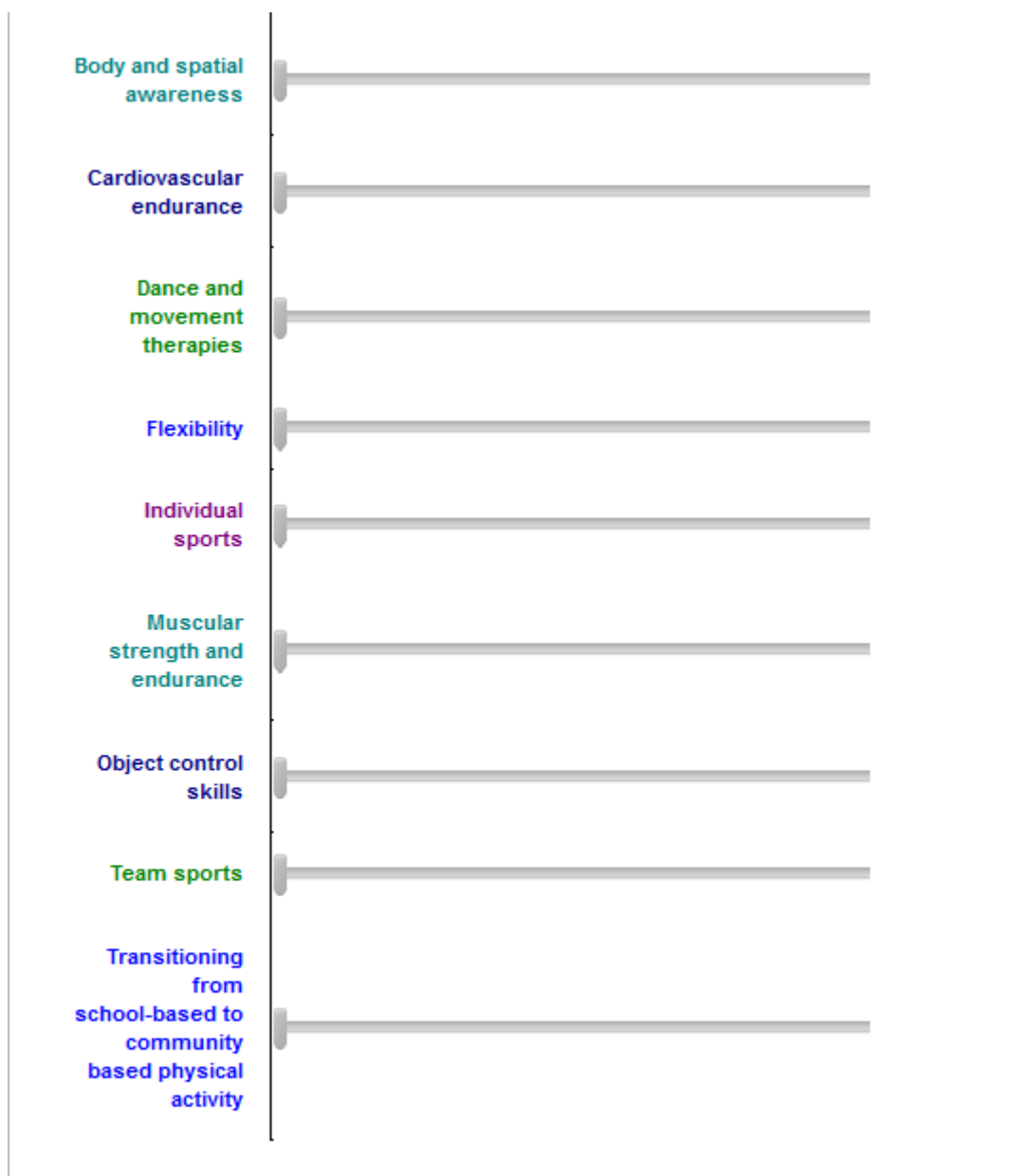
ONLY for students **3-9 years old (Preschool to 5th grade)** with TBI.



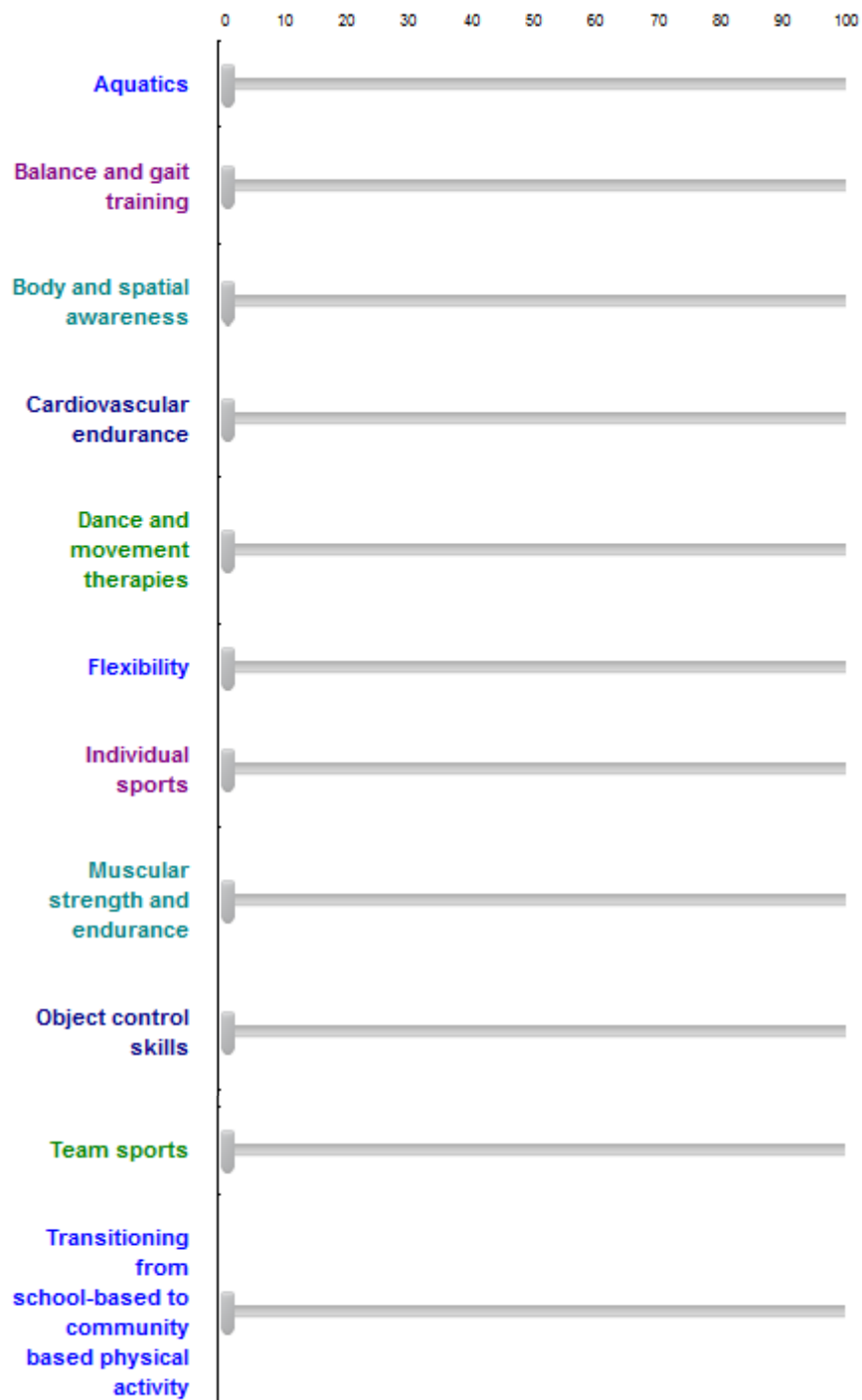


ONLY for students 10-14 years old (grades 6th to 8th) with TBI.





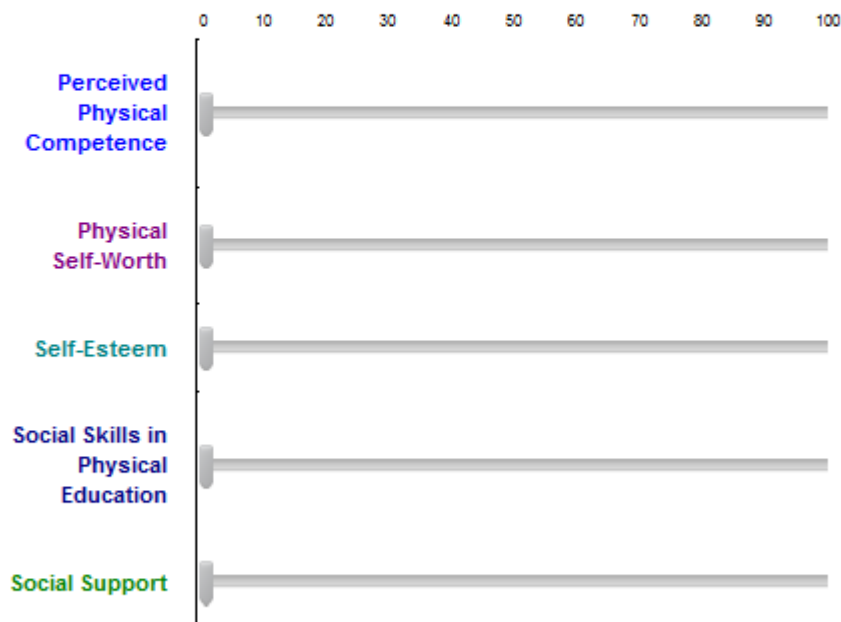
ONLY for students 15-21 years (grades 9th to 12th) with TBI.



Beside each category is a scale for prioritizing the affective domain area. Please consider each social aspect as it relates to students with Traumatic Brain Injury and their future social skill development. Your prioritizing of social aspects should be for students with Traumatic Brain Injury across their entire PK-12 education experience, not for any one student or at any particular age or grade level.

Note: a low priority is a 0 while the highest priority is 100.

****Place your cursor over the colored term for the definition.**

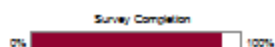


Survey Completion
0% 100%

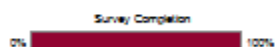


Please feel free to provide any questions, comments, or justification of your rankings (numbering) or prioritizings (sliding scale).

Thank you for participating in our study about physical education curriculum content for students with Traumatic Brain Injury. By clicking the next button ">>" on this page, you are giving your informed consent to participate in this study.



We thank you for your time spent taking this survey.
Your response has been recorded.



APPENDIX C
MEDICAL PERSONNEL
ONLINE SURVEY

Thank you for participating in our study about physical education curriculum content for students with **Traumatic Brain Injury**. Your participation should take about 10 – 15 minutes. All of the information you submit will be anonymous and only group data will be used in publications or presentations. By clicking the "submit" button at the end of the survey, you are giving your informed consent to participate in this study. Again, thank you for your time and valuable information.

Survey Completion
0% 100%

>>

Gender:

- ☐ Male
☐ Female

What is your current medical profession?

What type of medical facility do you work at?

- ☐ Clinic
☐ Hospital
☐ Residential (live-in facility)
☐ Other (please specify)

What is your primary involvement with school aged patients with Traumatic Brain Injury (TBI)?

How many school aged patients with Traumatic Brain Injury (TBI) do you currently have on your case load?

☐ 1-2

☐ 3-5


☐ 6-8

☐ More than 8 (please specify)

☐ I do not currently have a patient with TBI on my case load, but I have worked with them in the past.

☐ I do not currently have a patient with TBI on my case load, and I have NOT worked with them in the past.

Survey Completion

0%  100%

<< >>

How frequently do you communicate with **adapted physical educators (APE)** about school aged patients with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never

How frequently do you communicate with **general physical educators (GPE)** about school aged patients with Traumatic Brain Injury regarding physical education content?


- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never
- ☐ Same as ABOVE. I do not differentiate between APE and GPE.

How frequently do you communicate with the school district's physical therapist about school aged patients with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never

How frequently do you communicate with other medical personnel about school aged patients with Traumatic Brain Injury regarding physical education content?

- ☐ Multiple times a day
- ☐ Once a day
- ☐ Multiple times a week
- ☐ Once a week
- ☐ Other (please specify)
- ☐ Never

Survey Completion
0%  100%

<< >>

The following questions apply to individuals with **MODERATE to SEVERE** Traumatic Brain Injury, as measured by the Glasgow Coma Scale, at least one year post-injury. Someone with moderate TBI generally receives a score of 9–12 on the GCS, while someone with severe TBI receives a score of 8 or below. This survey is NOT asking about concussions or post-concussive syndrome.

Click and drag the content area to your preferred ranking as listed on the right hand side to rank order the following physical education content areas from the most to least important for students with TBI. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "11" for the least important. Your ranking of content areas should be for students with TBI across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Aquatics	1
Balance and gait training	2
Body and spatial awareness	3
Cardiovascular endurance	4
Dance and movement therapies	5
Flexibility	6
Individual sports	7
Muscular strength and endurance	8
Object control skills	9
Team sports	10
Transitioning from school-based to community based physical activity	11

Click and drag the social aspect to your preferred ranking as listed on the right hand side to rank order the following social aspects within physical education from the most to least important for students with Traumatic Brain Injury. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "5" for the least important. Your ranking of social domain areas should be for students with Traumatic Brain Injury across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Perceived Physical Competence	1
Physical Self-Worth	2
Self-Esteem	3
Social Skills in Physical Education	4
Social Support	5

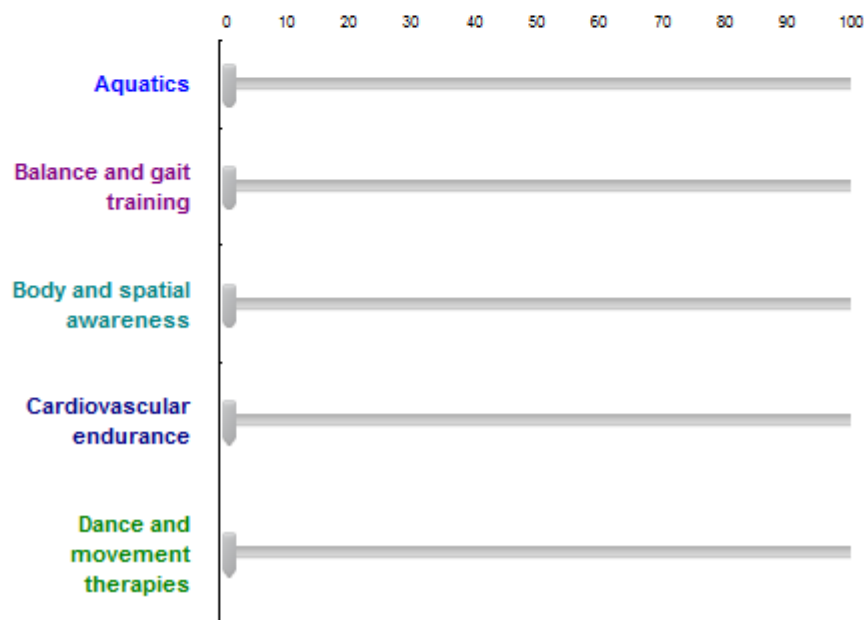


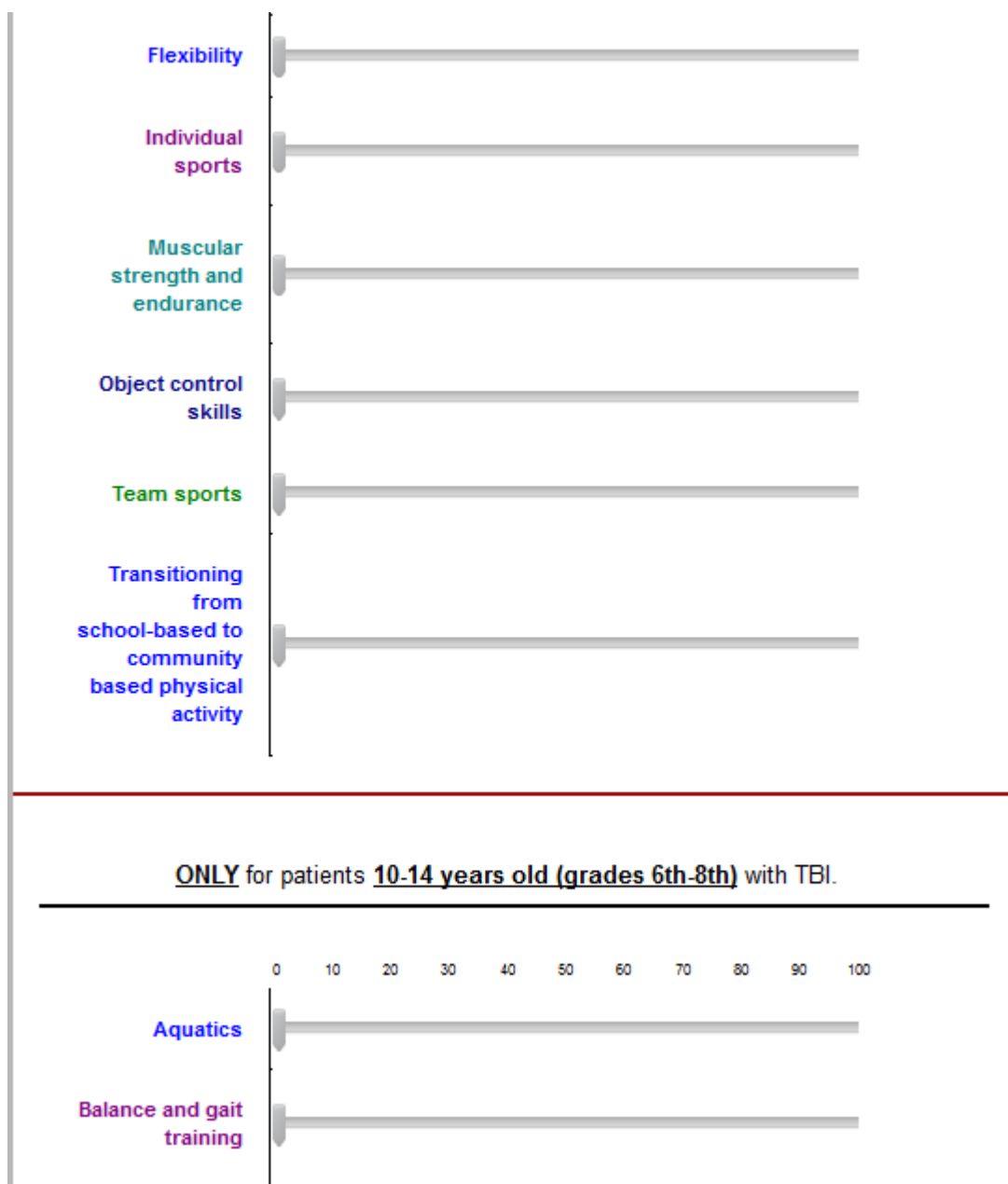
Below are 3 sections to prioritize physical education content areas by age and grade level. Beside each category is a scale for prioritizing the specific content area. Please consider each content area as it relates to students with Traumatic Brain Injury and their future development of skills and knowledge. Your prioritizing of content areas should be for students with Traumatic Brain Injury according to their age and grade range.

Note: a low priority is a 0 while the highest priority is 100.

****Place your cursor over the colored term for the definition.**

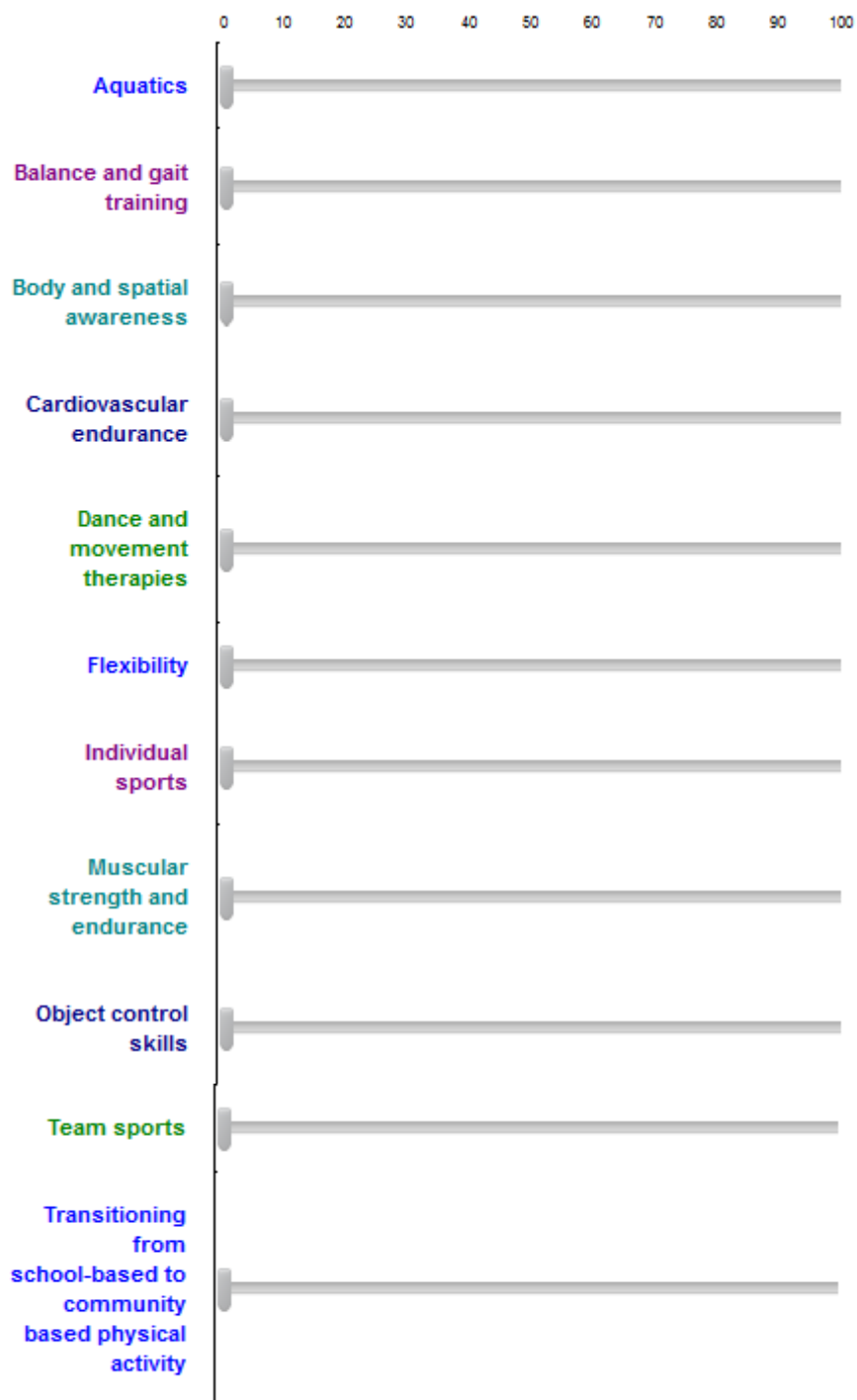
ONLY for patients 3-9 years old (Preschool to 5th grade) with TBI.







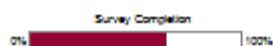
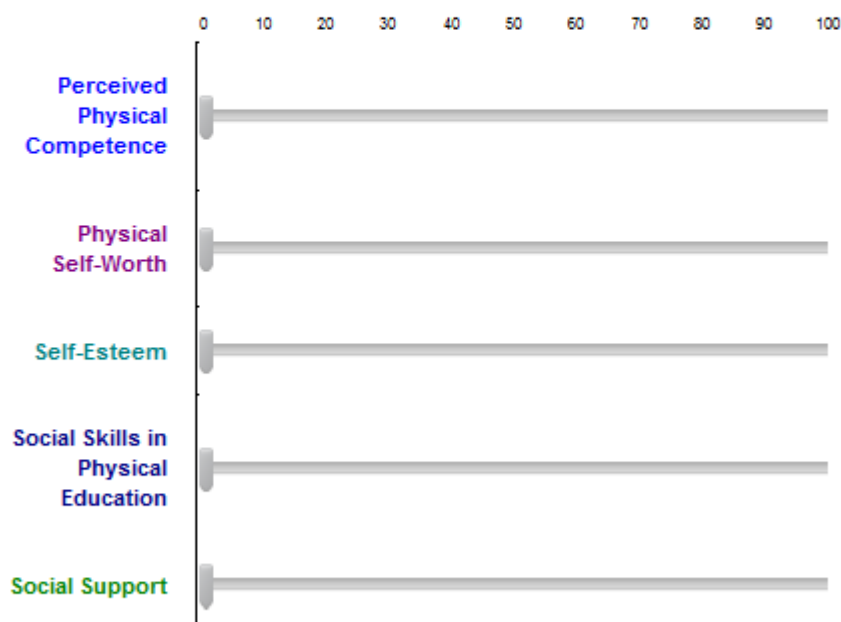
ONLY for patients 15-21 years old (grades 9th to 12th) with TBI.



Beside each category is a scale for prioritizing the affective domain area. Please consider each social aspect as it relates to school aged patients with Traumatic Brain Injury and their future social skill development. Your ranking of social aspects should be for school aged patients with Traumatic Brain Injury across their entire PK-12 education experience, not for any one patient or at any particular age or grade level.

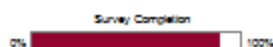
Note: a low priority is a 0 while the highest priority is 100.

****** Place your cursor over the colored term for the definition.

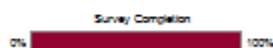


Please feel free to provide any questions, comments, or justification of your rankings (numbering) or prioritizings (sliding scale).

Thank you for participating in our study about physical education curriculum content for students with Traumatic Brain Injury. By clicking the next button ">>" on this page, you are giving your informed consent to participate in this study.



We thank you for your time spent taking this survey.
Your response has been recorded.



APPENDIX D
PHYSICAL THERAPISTS
ONLINE SURVEY

Thank you for participating in our study about physical education curriculum content for students with **Traumatic Brain Injury**. Your participation should take about 10 – 15 minutes. All of the information you submit will be anonymous and only group data will be used in publications or presentations. By clicking the "submit" button at the end of the survey, you are giving your informed consent to participate in this study. Again, thank you for your time and valuable information.

Survey Completion
0% 100%

>>

Gender:

- ☐ Male
☐ Female

In which state do you currently work?

- ☐ Minnesota
☐ Wisconsin
☐ Other (please specify)

Are you currently a full time physical therapist in a PK-12 school district?

- ☐ Yes
☐ No
☐ Other (please specify)

Survey Completion
0% 100%

<<

>>

At what level do you primarily work?

- ☐ Preschool
- ☐ Elementary
- ☐ Middle
- ☐ High School
- ☐ K - 12
- ☐ Other (please specify)

How many students with Traumatic Brain Injury (TBI) do you currently have on your case load?

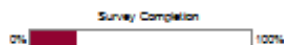
- ☐ 1-2
- ☐ 3-5
- ☐ 6-8
- ☐ More than 8 (please specify)

- ☐ I do not currently have student with TBI on my case load, but I HAVE worked with students with TBI in the past.
- ☐ I do not currently have student with TBI on my case load, and I have NOT worked with students with TBI in the past.

How many students with Traumatic Brain Injury (TBI) have you worked with in your career?

- ☐ 1-5
- ☐ 5-10
- ☐ 10-15
- ☐ More than 15 (please specify)

- ☐ I have not worked with students with TBI



How frequently do you communicate with **adapted physical educators (APE)** about students with Traumatic Brain Injury regarding physical education content?

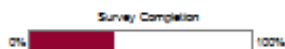
- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never

How frequently do you communicate with **general physical educators (GPE)** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never

How frequently do you communicate with **non-school medical personnel** about students with Traumatic Brain Injury regarding physical education content?

- ☐ Once a week
- ☐ Once a month
- ☐ Once a year
- ☐ Other (please specify)
- ☐ Never



<<

>>

The following questions apply to individuals with **MODERATE to SEVERE** Traumatic Brain Injury, as measured by the Glasgow Coma Scale, at least one year post-injury. Someone with moderate TBI generally receives a score of 9–12 on the GCS, while someone with severe TBI receives a score of 8 or below. This survey is NOT asking about concussions or post-concussive syndrome.

Click and drag the content area to your preferred ranking as listed on the right hand side to rank order the following physical education content areas from the most to least important for students with TBI. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "11" for the least important. Your ranking of content areas should be for students with TBI across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Aquatics	1
Balance and gait training	2
Body and spatial awareness	3
Cardiovascular endurance	4
Dance and movement therapies	5
Flexibility	6
Individual sports	7
Muscular strength and endurance	8
Object control skills	9
Team sports	10
Transitioning from school-based to community based physical activity	11

Click and drag the social aspect to your preferred ranking as listed on the right hand side to rank order the following social aspects within physical education from the most to least important for students with Traumatic Brain Injury. Use a "1" to indicate the most important item, a "2" for the second most important, and so on to "5" for the least important. Your ranking of social domain areas should be for students with Traumatic Brain Injury across the entire PK-12 educational experience, not for any one student or at any particular age or grade level.

**Place your cursor over the colored term for the definition.

Perceived Physical Competence	1
Physical Self-Worth	2
Self-Esteem	3
Social Skills in Physical Education	4
Social Support	5

Survey Completion
0%  100%

<< >>

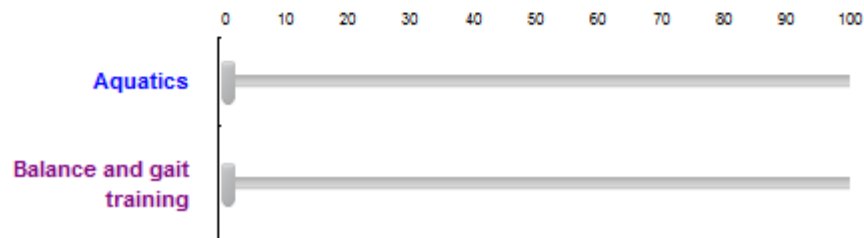
UNIVERSITY of WISCONSIN LA CROSSE

Below are 3 sections to prioritize physical education content areas by age and grade level. Beside each category is a scale for prioritizing the specific content area. Please consider each content area as it relates to students with Traumatic Brain Injury and their future development of skills and knowledge. Your prioritizing of content areas should be for students with Traumatic Brain Injury according to their age and grade range.

Note: a low priority is a 0 while the highest priority is 100.

**Place your cursor over the colored term for the definition.

ONLY for students 3-9 years old (Preschool to 5th grade) with TBI.





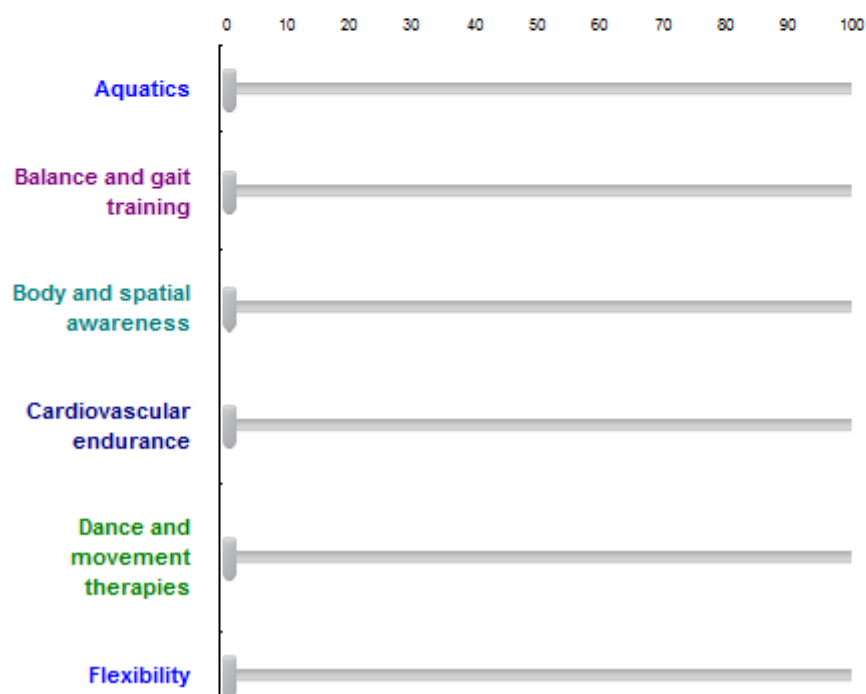
ONLY for students **10-14 years old (grades 6th to 8th)** with TBI.

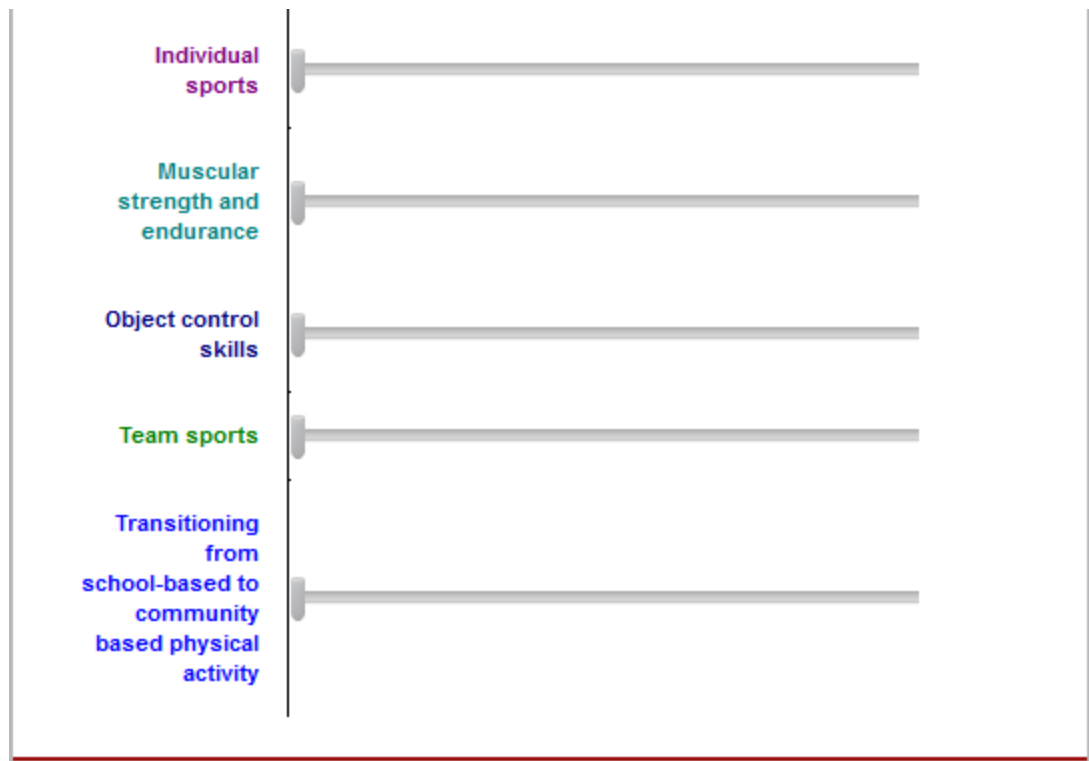


Team sports

Transitioning
from
school-based to
community
based physical
activity

ONLY for students 15-21 years old (grades 9th to 12th) with TBI.

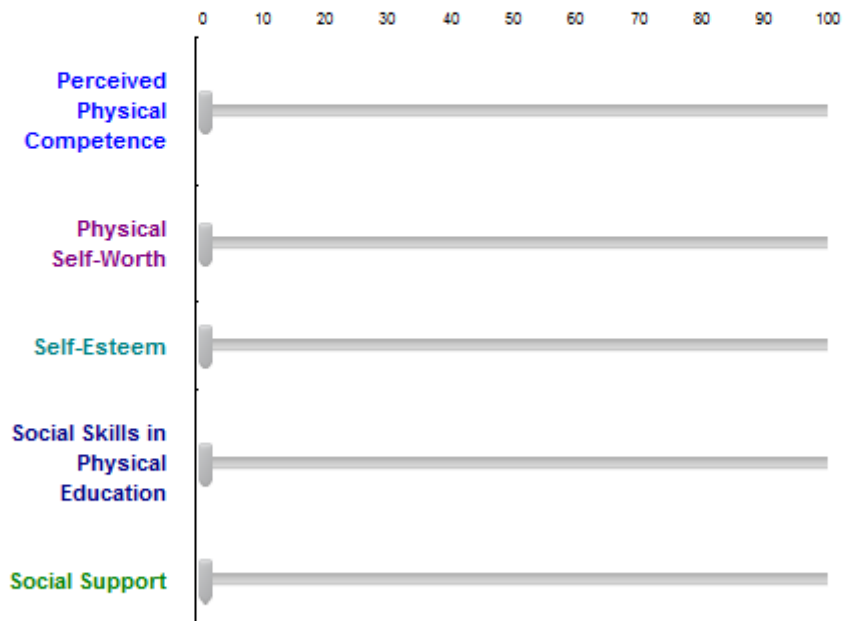




Beside each category is a scale for prioritizing the affective domain area. Please consider each social aspect as it relates to students with Traumatic Brain Injury and their future social skill development. Your ranking of social aspects should be for students with Traumatic Brain Injury across their entire PK-12 education experience, not for any one student or at any particular age or grade level.

Note: a low priority is a 0 while the highest priority is 100.

****Place your cursor over the colored term for the definition.**



Survey Completion
0% 100%

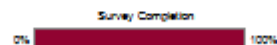


Please feel free to provide any questions, comments, or justification of your rankings (numbering) or prioritizings (sliding scale).

Thank you for participating in our study about physical education curriculum content for students with Traumatic Brain Injury. By clicking the next button ">>" on this page, you are giving your informed consent to participate in this study.



We thank you for your time spent taking this survey.
Your response has been recorded.



APPENDIX E

KEY FOR PHYSICAL ACTIVITY CONTENT AREAS

Physical Education Content Priority Areas*

1. Aquatics - include activities conducted in the water such as swimming, treading water, water survival skills, aqua jogging, and other water activities.
2. Balance and gait training - includes various tasks used to achieve or maintain a position of steadiness while resting on a narrow or movable base and patterns of movement of the lower limbs for locomotion over stable surfaces.
3. Body and spatial awareness - is an individual's ability to connect contextual information such as an individual's location, positioning, activity, and proximity to other people or objects.
4. Cardiovascular endurance - the ability of the circulatory system to pass the required nutrients (such as amino acids and electrolytes), gasses, hormones, and blood cells to the desired areas of the body to perform prolonged work tasks.
5. Dance and movement therapies - include moving the body through space with repetitive movement patterns in relation to the rhythm of music.
6. Flexibility - is the ability to move through a wide variety of range of motions.
7. Individual sports - include popular sports that involve one player or teams of no more than two players such as golf, wrestling, tennis, and cross country running.
8. Muscular strength and endurance - is the ability to carry out physically demanding tasks over a prolonged period of time.
9. Object control skills - include skills such as underhand rolling, underhand throwing, overhand throwing, catching, dribbling, and kicking.
10. Team sports - include popular sports that involve three or more players per side such as soccer, baseball, and volleyball.
11. Transitioning from school-based to community based physical activity - includes learning how to independently access out of school facilities in the community to engage in physical activity, including demonstrating appropriate social behaviors.

*Definitions adapted from: Block, M. E. (2007). Chapter 1: What is physical education? In A Teacher's Guide to Including Students with Disabilities in General Physical Education, 3rd Edition, (pp. 1-14). Baltimore: Brooks Publishing.

Social Constructs*

1. Perceived physical competence - an individual's belief in their ability within a specific domain such as physical, academic or social.
2. Physical self-worth - the perception of how individual's feel about themselves physically.
3. Self-esteem - the perception of how individual's feel about themselves physically.
4. Social skills in physical education - include communication, interacting, and cooperating with students and teachers.
5. Social support - a multidimensional construct consisting of type and source of support, which is defined by an exchange of resources between individuals.

*Adapted from: Driver, S. (2005) Social support and the physical activity behaviours of people with a brain injury. *Brain Injury*, 19(13), 1067-1075. and Driver, S. (2008) Development of a conceptual model to predict physical activity participation in adults with brain injuries. *Adapted Physical Activity Quarterly*, 25, 289-307.

APPENDIX F

REVIEW OF RELATED LITERATURE

Review of Related Literature

Introduction

Traumatic brain injury (TBI) “is the leading cause of long-term disability in children and young adults” (Katz-Leurer, Rotem, Keren, & Meyer, 2010). Unlike other disabilities, TBI varies largely due to the nature of the injury. Depending on the mechanism of injury, the area of the brain that is damaged, and the severity of that damage, two individuals with TBI may present in very different ways. However, a common concern for individuals with TBI is restoring basic motor functions so individuals can return to an independent lifestyle.

Persons with TBI may see a variety of health care professionals, therapists, and specialized educators from the onset of their incident through the remainder of their life. Initially an individual with TBI is treated by the emergency room trauma team and it is there that the individual will be evaluated for the first time using the Glasgow Coma Scale (GCS). The GCS establishes an individual’s level of consciousness (National Center for Injury Prevention and Disease Control, 2012). The scale ranges from 3-15 and assesses visual, verbal, and motor responses. Various cutoffs on the scale establish the severity of an individual’s TBI. GCS score cutoffs are: mild TBI 13 and above, moderate TBI 9-12, and severe TBI an 8 or lower. After individuals are stabilized they may need the additional support and training of a live in rehabilitation facility before being sent home. Here they will receive specialized attention to address basic movement skills. Some individuals will continue with physical therapies long after they leave the rehabilitation facility, while others will need no further interventions. Unfortunately, a common characteristic of TBI is the presence of reoccurring symptoms and a decrease in

levels of physical activity participation post injury. One way to address these characteristics is through the use of various exercise interventions.

Individuals with TBI present a unique challenge of needing exercise intervention programs with physical activities that best serve their specific motor disability needs such as aerobic conditioning, strength training, aquatic activities, and balance and gait training. These physical activities also need to positively reinforce affective domain characteristics such as self-esteem, sense of self, social support, and motivation. The purpose of this study was to compare the physical activity recommendations for school-aged individuals with TBI by general and adapted physical educators, physical therapists, and medical professionals to evaluate which of these activities are perceived to have the greatest impact on overall recovery.

Only through a structured analysis of the current exercise interventions being offered from the related experts: general and adapted physical educators, physical therapists and medical professionals, can the best exercise interventions be defined, measured, analyzed, and ultimately improved to better the overall quality of life of individuals with TBI. By evaluating targeted physical activity areas general and adapted physical educators, physical therapists, and medical professionals will be able to provide higher quality physical education and exercise intervention programs to individuals with TBI. This review of literature is comprised of the following sections: determinants of physical activity following TBI, effects of physical activity on social constructs for individuals with TBI, and physical activity areas of interest for individuals with TBI.

Determinants of Physical Activity following a Traumatic Brain Injury

Driver (2009) states that physical activity is any form of planned exercise, movement, or activity of daily living. However, individuals with disabilities participate in physical activities at lower levels than the general population, but it is their increased risk of morbidity and mortality that makes participation in physical activity so important (Driver, 2009). Increased levels of physical activity can improve range of motion, flexibility, and cardiovascular endurance, which in turn increases functional independence and increases quality of life for individuals with TBI (Driver, 2009). Therefore it is necessary to understand what barriers to physical activity individuals with TBI face.

Driver (2009) conducted a study where participants completed a short questionnaire that evaluated individuals with TBI level of physical activity post injury, barriers to physical activity participation, and interest in starting a physical activity program. The study included questions from the Leisure Time Exercise Questionnaire (Godin & Shepard, 1985) and Barriers to Physical Activity and Disability Scale (Rimmer, Riley, & Rubin, 2001). Driver (2009) found that individuals with TBI were highly motivated to exercise if a program was provided. Participants stressed that it was important to be good at the activity and be in good physical shape. Additionally, individuals with TBI ranked the greatest barriers to physical activity were as cost, lack of transportation, and lack of assistance, with the least ranked barriers being lack of knowledge of the benefits of exercise and lack of mobility.

Overall the study found that individuals with TBI were interested in participating in physical activity but because of the new barriers the likelihood of gaining the

associated health benefits from physical activity were diminished. In order for physical activity interventions to be effective practitioners must factor in these new barriers. By designing exercise interventions that include education and physical assistance as central components these programs can enhance physical activity participation for individuals with TBI (Driver, 2009).

Understanding the determinants of why individuals with TBI choose not to participate in physical activity is a complex, multi-dimensional problem. Therefore multiple studies should be used to explore these barriers. Reavenall and Blake (2010) explored these determinants using a multi-centre cross section questionnaire of a convenience sample made up of individuals with TBI all at least 1 year post injury.

This was an expansive questionnaire that evaluated personal and social measures of physical activity participation, activities of daily living, self-efficacy, social support, and mood (Reavenall & Blake, 2010). The study used the six-part Stages of Exercise Behaviour Change Model, the 22 item Extended Activities of Daily Living Scale (EADL), the 9-item Self-Efficacy for Exercise Scale, the 13-item Social Support and Exercise Scale, and the General Health Questionnaire- 12. Reavenall and Blake (2010) found that self-efficacy greatly predicted performance and that the most common barriers to physical activity were lack of motivation and personal health. Additional barriers were cognitive problems that related to memory, concern about seizures or epilepsy, physical problems with pain, and daily stressors.

Like the previous study, this research emphasized more support from the practitioners of the exercise interventions and stipulated that by educating individuals with TBI about the benefits of physical activity they would be more motivated to

participate. This participation is important only if the exercise interventions being done have a positive effect on the health related benefits of physical activity for the participants.

Individuals with TBI spend a great deal of time immediately after the initial injury working to regain motor functions at the hospital and live in rehabilitation facilities. Some individuals will leave these facilities and require no further exercise interventions. By determining whether exercise interventions occurring a significant time after the injury are effective can provide direction for the kind of programs implemented.

Watson (2007) examined the effectiveness of various therapeutic exercise interventions 6 months after initial brain injury. The study postulated that motor recovery in an individual with TBI follows an 's' shaped curve, but the plateau in recovery post injury is not truly flat, instead recovery continues to occur but in smaller and smaller increments, to the point that the change is eventually negligible (Watson, 2007). Watson evaluated 18 studies from 1978 to 2004 where significant motor recovery was demonstrated no less than 6 months into recovery. The study found that significant motor recovery occurred up to 15 years after the injury, but the majority of studies demonstrated recovery within 5 years post injury (Watson, 2007). Therefore continued physical activity specifically geared to remediate movement concerns for individuals with TBI is beneficial for many years after the initial injury and related physical activities should continue to be encouraged well past the principal recovery period following the injury.

The goal of any exercise intervention is to help individuals achieve their previous level of motor performance. Knowing that motor recovery is possible well after the initial recovery should guide and inform the practitioners that plan exercise interventions for

individuals with TBI. Additionally, as individuals with TBI progress through the recovery process the emphasis slowly transitions from just motor functioning to the psychological, emotional, and social aspects of recovery that affect overall quality of life.

Effects of Physical Activity on Social Constructs for Individuals with TBI

After their initial injury, individuals with TBI have a support network made up of a vast array of individuals including friends, family members, health professionals, specialists, support staff, teachers, and special education professionals. These people help individuals with TBI regain their independent lifestyle. The way these groups of people perceive physical activity has the potential to influence individuals with TBI physical activity behaviors (Driver, 2005). Driver (2005) defines social support as, “a multi-dimensional construct consisting of source and type of support and it is characterized by an exchange of resources between individuals.” By examining the role that social support plays in the recovery of individuals with TBI it can be better understood how individuals with TBI are motivated to participate in physical activity.

These groups of people can provide positive emotional support, which encourages motivation, exercise adherence, and greater life satisfaction. They can also provide unsupportive types of behavior, including impatience, criticism, insensitivity, compromise, obligation, and overprotectiveness (Driver, 2005). Driver (2005) did an evaluation of the Social Support for Exercise Habits Scale, the Social Provisions Scale, and the Social Influences Scale. It was found that individuals go through various stages of recovery. Of particular importance are the immediate response and maladaptive periods. The immediate response period happens within the first 6 months after the injury and involves mobilizing family members to allocate resources, adjusting and meeting

new challenges provided by the injury, and providing high levels of support (Driver, 2005). This period eventually tapers off and leads into the maladaptive period. During this period individuals with TBI experience negative influences, especially overprotection. Driver (2005) defines overprotection as a behavior that undermines an individual's belief in their ability to exercise frequently and adhere to rehabilitation programs. Additionally, friend support begins to fade out and in turn there is a decrease in the perceived quality of life as individuals with TBI become more isolated and further removed from the activities they did pre-injury. Driver (2005) found that individuals exposed to these negative influences are less motivated to participate in physical activity and gain fewer psychosocial benefits of physical activity.

Driver (2005) found that social support is important in the success of any recovery program because of the main role it plays in balancing the stress individuals with TBI feel in relationship to the physical, cognitive, and psychosocial impairments of their disability. Thus it is important to consider the social consequences of any physical activity intervention. The practitioners that design these physical activity programs need to incorporate the link between increased social support and positive health behaviors (Driver, 2005). By doing so they may increase overall physical activity participation and exercise adherence.

Participation in physical activity is influenced by many factors, but one of the most influential factors is motivation. If the factors that motivate individuals with TBI to participate in physical activity can be better understood then the practitioners that design these exercise interventions can create the most appropriate physical activities. These physical activities need to match the specified areas that increase motivation and in turn

physical activity participation. Further studies are needed to explore appropriate physical activities that increase motivation and overall participation.

Driver (2008) evaluated individuals with TBI who could complete activities independently, solve problems, and recall relevant information. The participants were all at least one year post injury. All participants took a modified version of Leisure Time Exercise Questionnaire and reported the number of times they participated in mild, moderate, and strenuous physical activity for at least 15 minutes for the duration of a week. The Social Influences Scale was used to assess how individuals with TBI perceived family, friend, and caregiver influence, perceived physical competence in physical activity, and physical self-worth. Driver (2008) found that affect, an emotional reaction that influences an individual's motivation, was the main variable in predicting physical activity participation and is strongly correlated to social support, self-worth, and motivation. Ultimately, to increase physical activity participation practitioners need to increase intrinsic motivation, which will increase the level of physical activity allowing individuals with TBI to gain the health related benefits (Driver, 2008).

Results of this study can guide practitioners to create exercise interventions where individuals with TBI can experience mastery, which in turn increases social support and enhances positive affective experiences (Driver, 2008). By understanding how to get individuals with TBI motivated to participate in physical activity, general and adapted physical educators, physical therapists, and medical professionals can increase the likelihood of having individuals with TBI participate in physical activity consistently enough to gain health-related benefits.

One way to understand how to get individuals motivated is to evaluate their mood states following physical activity. To understand these changes in mood after participation in physical activity it must be conceptualized within a self-efficacy theory. Self-efficacy comes from many sources including past performances, vicarious experiences, verbal persuasion, and physiological states (Driver & Ede, 2009). The most influential determinant of self-efficacy and therefore mood and future behaviors are past performances or mastery attempts (Driver & Ede, 2009). If practitioners successfully incorporate physical activity programs individuals will demonstrate their experienced mastery by changing their daily routines, interacting socially with others, enhancing components of fitness, and mastering physical and psychological skills (Driver & Ede, 2009). By evaluating individuals' mood states post-physical activity it can be understood where individuals are in their recovery process.

Driver and Ede (2009) created an aquatic physical activity intervention group that lasted for 8 weeks and was made up of 24 sessions. They also had a control group complete a vocational rehabilitation program for the same duration. Participants for each group were from a stratified random sample and all had to be at least one year post injury and were outpatients at a rehabilitation center. Individuals completed the Profile of Mood States (POMS) both before and after physical activity participation. The POMS evaluated six measures of mood including tension, depression, anger, vigor, fatigue, and confusion. It was found that individuals with TBI experienced improvement in positive mood states, vigor, and decreases in negative mood states, anxiety, depression, anger, fatigue, and confusion following physical activity. Physical activity participation helped individuals with TBI to overcome anxiety about falling during balance and movement activities

(Driver & Ede, 2009). It also helped to decrease feelings of fatigue allowing individuals with TBI to return to higher participation levels. Lastly, the improvements in vigor following physical activity have far reaching implications. Without regular physical activity individuals with TBI often report decreased feelings of vigor during physical activities and cannot participate at higher intensity levels preventing them from gaining the health related benefits of physical activity (Driver & Ede, 2009).

An individual's mood pre- and post physical activity impacts their overall perception and motivation of the activity. If an individual experiences positive mood changes, mastery experiences, and is provided the adequate social supports their likelihood of then continuing participation in these physical activities increases. By increasing physical activity participation, the level of exercise intensity can also increase and allow individuals with TBI to gain the health-related benefits of physical activity. Next practitioners must find and implement the best suited physical activities as necessitated by the unique range of needs of an individual with TBI by evaluating the plethora of physical activity options.

Physical Activity Areas of Interest for Individuals with TBI

It is important to understand what promotes participation in physical activity, but it is equally important to know what physical activities individuals with TBI participate in during their leisure time, if any at all. Katz-Leurer, Rotem, Keren, and Meyer (2010) described leisure time physical activities (LTPA), and physical capabilities that greatly influence LTPA such as balance, muscle strength, and walking performance. They assessed the associations between the two for children ages 7-13 with TBI, at least one year post injury, and a control group of typically developing children. LTPA were

assessed using a questionnaire that evaluated self-reported participation in strenuous, moderate, and mild exercise during a typical week. This included any physical activity that lasted for more than 15 minutes and happened outside of the physical education environment. Physical abilities were evaluated using the Functional Reach Test, Timed Up and Go Test, a 6 minute walking test, and an evaluation of gait parameters. Also evaluated were the maximal isometric strength tests of hip extensors and abductors and knee flexors and extensors for both limbs. Individuals were tested on one day in the same order with 5 minute breaks in between tests, and at all times used a wrist heart rate monitor.

It was found that typically developing children had a wide variety of popular leisure time activities such as strenuous swimming, judo, football, and basketball; moderate bicycling, ball games, and easy walking, while children with TBI listed moderate/easy swimming and easy walking (Katz-Leurer et. al., 2010). The physical performances of the two groups were relatively similar with slight differences for individuals with TBI including shorter step length, decreased balance performance, and greater effort reported for the same level of activities.

Though aerobic capacity was evaluated using only an estimated measure it did show that individuals with TBI had a reduced aerobic capacity and endurance capability compared to those of their typically developing peers. Katz-Leuer, et al (2010) state that this reduced cardiorespiratory fitness could be caused by the lack of physical activity, which in turn makes walking harder and therefore further limits the individuals' ability to participate. Additionally, individuals with TBI scored lower on their balance tests than their typically developing peers if they could perform them at all.

A possible solution might be specific balance training, which is a common goal of most exercise interventions for individuals with TBI. However, keeping children and adolescents with TBI interested in balance training can be a challenge. Conyers, Malkin, and Yang (2011) explored the effects of using a Nintendo Wii ® Fit Balance Board for balance training and body mass index (BMI). The Wii was selected because of its novelty; as a new, “fun” technology, user friendly capabilities, and its physical activity potential.

The participants were two teens, between the ages of 12-18, from a residential rehabilitation facility. The individuals were on the balance board for 12 sessions lasting 30 minutes each over a 4 week period. Their balance was assessed using the Berg Balance Scale (BBS), designed to measure the performance of functional task. The Wii has a built in scale and after each individual entered their height it calculated their BMI each time the participant played the Wii Fit game. To work on balance individuals played various games including the Penguin Slide Game, Table Tilt, Ski Slalom Race, and Down Hill Skiing.

Conyers, et al (2011) found significant improvements in the raw scores of the balance games played, but this improvement may have come not as a result of balance improvement but as a result of learning how to play and operate the game. Also, there was no significant improvement in balance scores as indicated by the pre- and posttest scores on the BSS. However, the researchers did see that the teenage participants enjoyed the activity and did not lose interest or decrease participation because of the high number of repetitions. In this way the engaging nature of the video game disguised the traditional exercise and provided instant feedback to the participant about their balance performance

in a safe way. Finally, there was no difference in the pre- and post BMI for participants possibly because of the short duration of the program or the lack of aerobic demands of the games being played (Conyers, et al 2011). Exploring the various methods of balance training, both traditional and unconventional, might allow for greater adherence to physical activity for individuals with TBI.

Balance training is especially important as it relates to an individual's vestibular function which is often affected as a result of TBI. The vestibular system works to process and provide information about movement as the brain orientates itself to its surrounding environment. This system cannot work alone and relies on visual and somatosensory information. When an individual can gather and process information from all of these systems they can move through an environment with little trouble. However, for individuals with TBI if these systems are affected they may have significant trouble with balance, difficulty focusing on objects, and complaints of dizziness. Peterson (2010) directly explored the relationship between visual and vestibular disturbances and its effects on mobility.

This study evaluated two cases of individuals with TBI sustained during active military duty. The goal in both cases was to return the individual to active duty. Each individual was assessed using a variety of tests to evaluate the extent of damage to their visual and vestibular systems. These tests included but were not limited to: Hallpike-Diz Test, Roll Test, Head Thrust Test, Dynamic Visual Acuity Test, Gaze Stability Test, Sensory Organization Test, Head-Shake Sensory Test, Motor Control Test, Adaptation Test, Berg Balance Scale, HiMAT test, and a functional gait assessment. Both individuals needed to be able to pass the Army Physical Fitness Test with a score of at least 60 points

for each test before being cleared for active duty. Based on the test results, various exercise interventions were implemented for the duration of their stay at the treatment facility. Both individuals showed marked improvement, but needed to be transferred to transitional units for additional rehabilitation services before being cleared for duty.

Peterson (2010) stated that, “any problem noted can limit the patient’s ability to effectively respond to changing surface characteristics and limit the ability to return to independent community ambulation.” The ability for an individual with TBI to successfully manipulate their environment whether for physical activity or just to get from one point to another is extremely important. By utilizing a variety of specific tests the researchers were able to pinpoint specific problem areas that they could then work to address. Individuals with TBI had to relearn how to process and evaluate various sensory information, adjust their processing order and time, and modify their movement in the continually changing environment (Peterson, 2010). Typically developed adults do “not need to concentrate on the visual or vestibular tasks; they are ingrained abilities that have gradually developed and were integrated earlier in life” (Peterson, 2010). However, a concern of the researchers is that ability to transfer what is practiced in a clinical setting into a real world environment. Further research is needed to find exercise interventions that address balance issues in a real world setting in a safe way for individuals with TBI.

One particular area of physical activity and exercise intervention that is well suited for individuals with TBI is in the aquatic setting. Degano and Geigle (2009) found, “that the physical properties of water provide valued somatosensory information that can be integrated into the nervous system in order to enhance proprioceptive feedback, and enhance automatic balance responses.” Additionally, the hydrostatic pressure of water

provides stimuli to the skin that relays constant information to the brain and works to improve kinesthetic awareness (Degano & Geigle, 2009). Lastly, because of the viscosity and resistance of the water and the increased sensory awareness prevents rapid falling by increasing the amount of time an individual has to process stimuli and react (Degano & Geigle, 2009). Therefore it is important to examine the effects of balance and gait training in an aquatics setting.

Degano and Geigle (2009) studied the quantitative and qualitative effects of aquatic and land-based exercise interventions on ataxia, balance, and gait one month post therapy. Individuals participated in two hours of land based physical therapy and one hour of aquatics programming. The aquatics interventions included: water walking, stepping over obstacles, walking and stepping over obstacles, step ups, standing therapeutic exercises, core stability exercises, kick board press downs with upper and lower extremities and plyometric and jumping activities (Degano & Geigle, 2009). Individuals were evaluated using the SMART Balance Master ® Limitis of Stability and Sensory Organization Test that assessed postural control for visual, vestibular, and somatosensory conditions with eyes both open and closed. Participants reported improved self-confidence and reduced fear of falling when walking and performing activities of daily living, more even step and stride length, increased weight bearing and decreased lateral lean (Degano & Geigle, 2009). Degano and Geigle (2009) found that both the sensory input and increased active movement stimulates motor learning and relearning improving balance, which in turn improves gait.

While balance and gait training are often targeted areas for exercise interventions it is also important to evaluate the effects of an aquatics program on fitness parameters

for individuals with TBI. Driver, O'Connor, Lox, and Rees (2004) conducted a study of eight men and women, 33 to 45 years old, from an outpatient facility randomly assigned to either the experimental group, participating in three 1-hour sessions per week, for eight weeks, or the control group, participating in a vocational reading and writing program, for the same duration of time. Participants had their physical work capacity, range of motion, and muscular strength and endurance evaluated. In addition to balance and gait improvements through aquatics programming, an increase in range of motion at the shoulders, hips, knees, and ankles, improved walking abilities, improved muscular endurance, increased grip strength, and increased submaximal cycle ergometry time were found (Driver et. al., 2004). Driver et al (2004) found that it was the relearning of skills that was the key to motor recovery process.

Summary and Conclusions

The effects of regular physical activity can drastically impact individuals' with TBI quality of life. Additionally, balance is an important factor for an individual with TBI because it greatly affects many activities within that person's life. By combining the use of balance as an exercise intervention and evaluating its effectiveness in producing health related benefits for individuals with TBI, physical therapists, adapted and general physical education teachers, and medical professionals can readily address needed areas of rehabilitation for this population.

A limitation of the studies reviewed is the small sample size of individuals with TBI, making it difficult to produce research that is valid and reliable and can be generalized. Additionally, difficulty with adherence rates can make the best exercise intervention programs fail. One of the best ways to gather information about this population is through the use of questionnaires and surveys, but these may not always be

accurate. However, because TBI is so individualized it is important to always leave room for additional comments and any further explanation as it is needed.

Though questionnaires and surveys are one of the best ways to get a large sample size for individuals with TBI, more research is needed with actual program interventions. Some of these interventions should include educating individuals with TBI about the benefits of physical activity and the best activities to participate in (Reavenail & Blake, 2010). Archer, Svensson, and Alricsson (2012) suggested that exercise programs be tailored to fit the needs of each individual with TBI until more information about outcome measures, design, and standardization of exercise schedules is made available. In order for such information to be made available there needs to be research to demonstrate what the best exercise interventions are and how they affect individuals with TBI. Additionally, by understanding the factors that influence participation in physical activity for individuals with TBI and knowing what exercise interventions are the best to use physical therapists, adapted and general physical education teachers, and medical professionals can better select appropriate activities that will effectively address movement concerns while keeping the individual performing the task actively engaged.

By working to have individuals with TBI participate in exercise interventions of this sort, adapted physical educators are creating a positive feedback cycle. The individual is challenged at an appropriate level but experiences success and is not restricted by barriers to the activity thus promoting further participation and greater health benefits. For example, Driver and O'Connor (2003, 30) state that by,

exercising regularly for eight weeks an individual may find that her swimming skills improve and that she is able to swim further, more easily,

and without getting tired. Thus her belief in her own ability to swim (e.g., her self-efficacy) has increased and she may feel more energy and enthusiasm (e.g., positive affect) and less fear or nervousness (e.g., stress, negative affect) with swimming considering her disability. Thus, by exercising regularly an individual with a brain injury may positively effect the psychological disturbances they experienced post injury.

This promotes physical activity as a therapy intervention because it demonstrates the effectiveness of exercise in addressing social constructs such as self-efficacy, sense of self and mood for individuals with TBI. In addition, by understanding how general and adapted physical educators, physical therapists, and medical professionals prioritize physical activity, it can in turn, be better understood how these physical activities affect individuals with TBI.

By understanding the complex psychological aspects that accompany physical activity and adherence to these activities, teachers and health professionals that work with individuals with TBI can increase these behaviors and in turn increase their quality of life. The use of regular exercise to facilitate the development of individuals' autonomy and ability to achieve a level of locomotor performance that places them within the societal norms to complete these tasks, allows these individuals to use these skills to re-establish themselves within a socially acceptable pattern of behavior and work their way back into the social environment (Driver et. al., 2004). "Finding activities, with guidance from health care professionals, that are accessible, enjoyable and appropriate based on level of function, interests in fitness, people with TBI will show improved level of community integration" (Thornton, Marshall, McComas, Finestone, McCormick, &

Sveistrup, 2005). By selecting the most appropriate physical activities with the correct social constructs individuals with TBI will want to seek out physical activities in the community and have greater participation in their overall recovery and return to pre-injury status.

Like the general population, people with TBI will participate in exercise activities that have meaning and value for them (Thornton et. al., 2005). Exercise interventions that have meaning and value consist of activities that adequately challenge the individual while still providing ample opportunities for mastery and skill success, address motor deficits that are unique to the individual, and take into account the perceptions of the support staff around the individual with TBI. Meaningful and valuable exercise interventions will increase exercise adherence. Increased exercise adherence will allow individuals with TBI to participate at higher levels of exercise intensity and experience greater levels of health related benefits of physical activity.

Through a structured analysis of the current exercise interventions being offered, general and adapted physical educators, physical therapists, and medical professionals can select the best physical activity exercise interventions for individuals with TBI. By increasing their overall health through physical activity exercise interventions individuals with TBI will increase their independence and overall quality of life similar to levels experienced pre injury. Therefore, there is need for a study to compare the physical activity recommendations for individuals with TBI by general and adapted physical educators, physical therapists, and medical professionals and to determine which of these activities has the greatest impact on overall recovery.

Future study is needed to answer the following research questions to illuminate the most appropriate exercise interventions for individuals with TBI. Which aquatic programming areas provided the greatest benefit for students with TBI? Do aquatics or land based programming provide a greater benefit for individuals with TBI? Can greater communication among adapted and general physical educators, medical personnel, and physical therapists result in better physical education services for students with TBI? Do parent opinions of physical activity content areas align with those of the professionals providing the programming? Does agreement on the physical activity content areas among parents, adapted and general physical educators, medical personnel, and physical therapists result in greater progress of motor skill development?

REFERENCES

- Archer, T., Svensson, K., & Alricsson, M. (2012). Physical exercise ameliorates deficits induced by traumatic brain injury. *Acta Neurologica Scandinavica*, 125, 293-302.
- Conyers, J. K., Malkin, M. J., & Yang, H. (2011). An exploratory study on the effects of Nintendo Wii® fit balance board on balance retraining and body mass index of adolescents with a traumatic brain injury. *American Journal of Recreation Therapy*, 10(2), 38-48.
- Degano, A. C., & Geigle, P. R., (2009). Use of aquatic physical therapy in the treatment of balance and gait impairments following traumatic brain injury: A case report. *Journal of Aquatic Physical Therapy*, 17(1), 16-21
- Driver, S. (2005). Social support and the physical activity behaviors of people with brain injury. *Brain Injury*, 19(13), 1067-1075.
- Driver, S. (2008). Development of a conceptual model to predict physical activity participation in adults with brain injuries. *Adapted Physical Activity Quarterly*, 25, 289-307.
- Driver, S. (2009). What barriers to physical activity do out patients with a traumatic brain injury face? *Journal of Cognitive Rehabilitation*, 27(3), 4-10.
- Driver, S., & Ede, A. (2009). Impact of physical activity on mood after TBI. *Brain Injury*, 23(3), 203-212.
- Driver, S., & O'Connor, J. (2003) Exercise participation, self-esteem, and affective experiences of people with a brain injury. *Journal of Cognitive Rehabilitation*, 21(2), 26-33
- Driver, S., O'Connor, J., Lox, C., & Rees, K. (2003). Effect of an aquatics program on psycho/social experiences of individuals with brain injuries: A pilot study. *Journal of Cognitive Rehabilitation*, 21(1), 22-31.
- Driver, S., O'Connor, J., Lox, C., & Rees, K. (2004). Evaluation of an aquatics programme on fitness parameters of individuals with a brain injury. *Brain Injury*, 18(9), 847-859.
- Godin, G., & Shephard, R. J. (1985) A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.

- Katz-Leurer, M., Rotem, H., Keren, O., & Meyer, S. (2010). Recreational physical activities among children with a history of severe traumatic brain injury. *Brain Injury*, 24(13/14), 1561-1567. doi:10.3109/02699052.2010.52304
- Peterson, M. D. (2010). A case-oriented approach exploring the relationship between visual and vestibular disturbances and problems of higher-level mobility in persons with traumatic brain injury. *Journal of Head Trauma Rehabilitation*, 25(3), 193-205.
- Reavenall, S., & Blake, H. (2010). Determinants of physical activity participation following traumatic brain injury. *International Journal of Therapy & Rehabilitation*, 17(7), 360-369.
- Rimmer, J., Riley, B., & Rubin, S. (2001). A new measure for assessing the physical activity behaviors of persons with disabilities and chronic health conditions: the Physical Activity and Disability Survey. *American Journal Of Health Promotion: AJHP*, 16(1), 34-42.
- Thornton, M., Marshall, S., McComas, J., Finestone, H., McCormick, A., & Sveistrup, H. (2005). Benefits of activity and virtual reality based balance exercise programmes for adults with traumatic brain injury: Perceptions of participants and their caregivers. *Brain Injury*, 19(12), 989-1000.
- Watson, M. J. (2007) Feasibility of further motor recovery in patients undergoing physiotherapy more than 6 months after severe traumatic brain injury: An updated literature review. *Physical Therapy Review*, 12, 21-32.