

Physical Activity Experiences of Individuals Living With a Traumatic Brain Injury: A Qualitative Research Exploration

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Traumatic brain injury (TBI) is a significant public health issue due to the incidence, complexity, and cost associated with treatment. The purpose of this study was to determine physical activity (PA) knowledge, attitudes, intentions, and barriers among individuals with a TBI undergoing outpatient rehabilitation. Seventeen participants completed a series of group interviews regarding their PA needs. A qualitative research design was adopted and trustworthiness was established through investigator triangulation of data. A cross-case analysis was completed to identify themes and conceptual patterns. The main themes identified were (a) an inability to differentiate between PA and physical therapy, (b) a limited knowledge of PA health benefits and the relationship to rehabilitation, and (c) an interest in participating in a PA based health promotion program. Future interventions should educate individuals about PA, the associated health benefits, and the role PA plays in the rehabilitation process.

Keywords: health promotion, group interviews, rehabilitation, needs assessment

Traumatic brain injury (TBI) is a significant public health issue in the United States due to the incidence, complexity, and cost associated with treatment. TBI is estimated to result in approximately 50,000 deaths in the United States per year. In addition, 2% of Americans (5.3 million people) require long-term care

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and assistance in performing activities of daily living due to their TBI (Centers for Disease Control and Prevention, 2010; Langlois, Rutland-Brown, & Thomas, 2004; Thurman, Alverson, Dunn, Guerrero, & Sniezek, 1999).

As damage to the brain can be very complex, individuals may experience a myriad of associated (e.g., spasticity, seizures, apraxia) and secondary conditions post TBI (National Institute of Neurological Disorders and Stroke, 2002). Secondary conditions are health concerns that are not a direct result of the primary disability but rather are acquired at a later time due to lifestyle changes associated with the disability (Rimmer & Rowland, 2008). The negative spiral of health caused by these conditions is compounded as individuals are placed at a greater risk of developing chronic conditions (e.g., cardiovascular disease, diabetes, arthritis) post TBI. Furthermore, one of the greatest challenges to individuals and specialists post TBI is psychosocial adjustment, which causes difficulty with relationships and socializing, apathy, depression and disrupted affect (Armstrong, 1991; Finset, Dyrnes, Krogstad, & Berstad, 1995; Finset & Andersson, 2000; Kwan & Sulzberger, 1995; Morton & Wehman, 1995). The varieties of psychosocial issues that can be present post injury are extremely stressful to individuals, further compounding the complexity (Morton & Wehman, 1995).

Due to the high incidence and complexity of TBI (i.e., interaction of associated, secondary, and chronic conditions), considerable medical costs are incurred. For example, in 2000, direct and indirect (e.g., loss of productivity) medical costs for TBI totaled an estimated \$60 billion in the United States (Finkelstein, Corso, & Miller, 2006), with the average per-person lifetime cost of care for TBI reaching as high as \$1,875,000 (National Institute of Health, 1998). Thus, researchers and clinicians are presented with a challenge to decrease the conditions resulting from a TBI as well as reduce the resultant healthcare costs (e.g., decreased utilization of medical services, medications for symptom management, frequency of rehospitalization, or institutional placement). Public health initiatives, such as a health promotion program (HPP) that incorporates interventions (e.g., informational, social, behavioral) to facilitate physical activity (PA) participation, can play an important role in this rehabilitation process (Lollar & Crews, 2003; Rimmer & Rowland, 2008), although PA centered HPPs are not currently part of the standard of care post TBI (Driver, Irwin, Woolsey, & Pawlowski, 2012). In addition, PA participation is recognized to decrease after TBI, when compared with preinjury levels (Fleming et al., 2011), emphasizing the importance of reengagement into relevant, age-appropriate PA. Despite the lack of participation, research has consistently demonstrated the benefits of PA for adults with a TBI (Irwin, Ede, Buddhadev, & Driver, 2011). For example, studies have reported that individuals with a TBI can experience improved physical (Bateman et al., 2001; Driver, O'Connor, Lox, & Rees, 2004; Fines & Nichols, 1994) and psychosocial functioning (Driver & Ede, 2009; Driver & O'Connor, 2003; Driver, O'Connor, Lox, & Rees, 2003) as well as improved health promoting behaviors (Driver, Rees, O'Connor, & Lox, 2006). Research has also highlighted the important role that PA can play in social integration post TBI (Driver, 2005) as family members become critical to continued PA participation (Driver, 2007). Consequently, PA can positively impact the physical and psychosocial issues experienced post TBI (Driver, 2008).

To increase the likelihood that PA levels are increased post TBI, it is recommended that interventions be theoretically based (Driver, 2006). For example, Driver

(2008) tested Harter's (1987) model of self-worth and found a good fit of the model as individuals with greater perceived competence and social support experienced improved affect, physical self-worth, and actual PA behavior, emphasizing the importance of increasing perceived competence and social support to facilitate PA participation. Due to the extensive benefits of PA participation, there is a need for interventions that facilitate the adoption and maintenance of PA behaviors for adults with a TBI (Driver, Irwin et al., 2012). This need is consistent with Healthy People 2020 which aims to (a) reduce the number of people with disabilities who report physical or program barriers to local health and wellness programs, (b) increase the number of HPP aimed at improving the health and wellbeing of people with disabilities, and (c) increase the number of people with disabilities who participate in recreational activities (USDHHS, 2010a). These objectives are particularly critical to individuals with a TBI due to the growing need to reduce the effect of associated, secondary, and chronic conditions as well as the escalating medical costs (Finkelstein et al., 2006; Langlois et al., 2004; Lollar & Crews, 2003). Consequently, there is a call for a HPP that addresses the PA behaviors of individuals with a TBI (Driver, Ede, Dodd, Stevens, & Warren, 2012; Driver, Irwin et al., 2012).

Designing an Effective Health Promotion Program

According to the USDHHS (2010b), when designing an informational, social, and/or behavioral intervention there are several steps that must be taken, each of which is based on a review of the literature about PA interventions (Kahn et al., 2002). The first step involves creating an "audience profile" of your target population (i.e., individuals with a TBI enrolled in a comprehensive outpatient program). This can involve adopting a variety of qualitative and quantitative methods to understand the unique characteristics and behaviors of the target population. Specifically, when developing the audience profile, it is recommended that information be collected to (a) assess the individual's knowledge and awareness about PA, (b) determine the individual's readiness to be active, and (c) identify any barriers to participation. An HPP that is developed without an understanding of the targeted population, fails to use the appropriate social behavioral strategies, and implements a "one size fits all" program is likely to fall short of the intended outcome (Lox, Martin, & Petruzzello, 2003; Prochaska & DiClemente, 1983). Consequently, the purpose of this study was to determine PA knowledge, attitudes, intentions, and barriers among individuals with a TBI undergoing outpatient rehabilitation.

Method

Participant Recruitment

Approval to complete the study was received from an Institutional Review Board at both a medical center and university, ensuring that all procedures were considered ethical. Individuals were recruited from the comprehensive outpatient program at a rehabilitation center, which is a part of the postacute continuum of care that follows inpatient rehabilitation. Patients enrolled in the comprehensive outpatient

program have completed inpatient therapy are now living at home but attend the program between 9 a.m. and 3 p.m., 5 days per week (M stay = 8 weeks). The comprehensive outpatient program involves an interdisciplinary approach (i.e., physical, occupational, speech therapy, therapeutic recreation, and neuropsychology) to rehabilitation which focuses on meeting the participant's outcome goal (e.g., return to work, school).

Participants were chosen from the comprehensive outpatient program for four reasons. First, an HPP that includes education about PA is not included in the patient's standard of care. Second, the comprehensive outpatient program is a critical transition period for patients as they move from hospitalization after injury to living in their community. As a result, individuals are experiencing their daily routines (e.g., at home, in the community, with family, etc.) with their new abilities and are able to discuss issues faced in the rehabilitation setting. Third, the program is conducive to integrating a PA based HPP into the current standard of care as patients are already undergoing daily educational sessions (e.g., learning about chronic conditions associated with TBI such as smoking, depression, caregiver stress, etc.). Thus, this timeframe is representative of when the patients would receive a future HPP intervention. Fourth, individuals typically regain cognitive functioning as comprehensive outpatient treatment begins, thus increasing the likelihood that patients are able to engage cognitively in educational programs. Consequently, outpatient rehabilitation was deemed the best environment for the interviews.

Participants

Results obtained were composed from five group interviews consisting of 17 participants (5 females, 12 males), ranging from 18 to 61 years of age ($M = 28$; $SD = 13.5$), who each had a TBI. TBI was defined as "an alteration in brain function, or other evidence of brain pathology, caused by an external force" (Brain Injury Association of America, 2012). Additional descriptive statistics of participants included marital status (11 single, 4 married, 1 divorced, and 1 separated), ethnicity (9 Caucasian, 3 Black, 3 Hispanic, 2 Latino), and days with moderate intensity PA both pre- (i.e., $M = 4.6$ days) and postinjury (i.e., $M = 2.5$ days). Fourteen participants were independently mobile, one was wheelchair mobile, and one used a walker. Overall, five group interviews were conducted that consisted of 2–5 participants. Group size varied because sessions were only scheduled when at least two participants were discharging from the program during the same week. Two participants were considered the minimum number of participants appropriate to complete a group interview (Cresswell, 1998). Purposive sampling was used with multiple inclusion and exclusion criteria to ensure that participants were adults, were experiencing the TBI and going through rehabilitation for the first time, included individuals enrolled in outpatient rehabilitation (where a target HPP would be implemented), and were high cognitive functioning so that there was an increased likelihood that they could respond to questions and recall information. Inclusion criteria included (a) ages 18–64, (b) first-time TBI, (c) undergoing comprehensive outpatient rehabilitation, and (d) high cognitive functioning. Exclusion criteria included (a) nontraumatic brain injury (e.g., reoccurring injury, stroke) and (b) premorbid mental illness and/or premorbid developmental disability. (See Table 1 for participant demographic information.)

Table 1 Participant and Group Interview Characteristics

Group Interview Number	Participant	Age in Years	Time Between Injury and Interview (Months)	Etiology	Glasgow Coma Scale *
1	Female 1	47	1	Fall from horse	14
	Male 1	24	3	Fall	—
	Male 2	21	12	MVA	3
2	Male 3	19	10	MVA	—
	Male 4	18	3	—	—
3	Male 5	25	2	MVA	3
	Female 2	62	2	Fall	—
	Male 6	30	8	MVA	—
4	Female 3	20	1	MVA	3
	Female 4	52	3	Motorcycle	3
	Male 7	18	1	Skateboard	7–8
	Male 8	20	1	Boating accident	3
	Male 9	21	1	Hit by motorcycle	—
5	Female 5	44	5	Fall	14
	Male 10	25	3	MVA	—
	Male 11	23	4	Hit by train	—
	Male 12	18	4	MVA	3

*Glasgow Coma Scoring: Severe TBI ≤ 8 ; Moderate = 9–12; Minor ≥ 13 . MVA = Motor Vehicle Accident; — = missing data.

Group Interview Procedures

Individuals who met the inclusion criteria were approached for consent during the third week of enrollment in the comprehensive outpatient program to allow newly enrolled patients to become familiar with the structure and setting of the program before agreeing to participate in a research study. Individuals were informed about the purpose of the study, requirements, and that all information collected would be confidential and nonidentifiable. Individuals who provided consent were then scheduled to attend a group interview during the last two weeks of their enrollment. This timeframe was chosen as clinically patients at the medical center generally exhibit increased cognitive functioning as they approach discharge, in addition to having completed the majority of education classes so their knowledge level would be higher. The group interviews took place in a private conference room consistent with other educational programs offered as part of the rehabilitation program, and each session lasted 30–40 min. The group interview involved a researcher facilitating discussion through a series of guided, open-ended questions designed to stimulate responses followed with prompts used to elicit further responses (see Table 2 for detail on the process of question development). During the group interviews, each individual was given an opportunity to respond to the question posed. There were

Table 2 Steps in Developing Group Interview Questions

Step 1	Use a group interview methodology (Cresswell, 1998) Allow individuals to provide detail about their lived experiences through their own voice (Jones et al., 2009)
Step 2	Questions derived from review of HPP literature (Kahn et al., 2002) and recommendations from USDHHS (2010)
Step 3	Categories of questions identified (a) knowledge (b) attitudes and expectations (c) wants, intentions, and motivations and (d) barriers
Step 4	Questions were developed from categories by research team.
Step 5	Questions piloted with group of four individuals with a TBI and two clinical experts
Step 6	Based on feedback, questions were modified (i.e., order of questions, repetitive).
Step 7	Questions used with participants

differences in the amount of information that came from each individual, however, which is normal in group interviews (Cresswell, 1998), so the researcher asked follow up questions and used prompts in an attempt to elicit responses from each group member. Once the group interview was completed participants were finished with the study. Audio recordings of discussions were then transcribed and a cross-case analysis was completed to identify conceptual patterns and themes in responses (Jones, Richeson, Croteau, & Farmer, 2009). Cross-case analysis involves comparing similarities and differences in the events, activities, and processes that are the units of analyses in the group interviews (Cresswell, 1998).

Qualitative Analysis

Upon the completion of the final group interview, audio files were transcribed into written text. All questions from the interviewer, as well as all responses from the participants, were included in the transcriptions. In addition, all audible behaviors (e.g., intonation, sounds, pauses) were transcribed and observations were noted (e.g., fidgeting, nervousness, uncertainty) in the transcriptions. The process of qualitative content analysis includes condensing raw data into themes based on valid inference and interpretation (Zhang & Wildemuth, 2009). This process utilizes inductive reasoning to extract themes from the data through careful examination and constant comparison of the data by the research team. Constant comparison analysis was used to identify underlying themes, or codes, within the data (Todd et al., 2004) and includes researchers reading through the entire set of data, chunking the data into smaller parts, and labeling each chunk with a descriptive title or code. Similar chunks are labeled with the same code. To establish credibility, the data were coded by three investigators (investigator triangulation) with backgrounds in PA. Coding the raw data entailed initially reading through the text data to identify and label specific segments of information. Approximately 35 codes were created after the initial coding process. These codes were then input into Atlas.t.i., a qualitative

computer analysis program used to systematically organize codes from text and allow researchers to locate, code, and evaluate the importance of designated pieces of data within the whole series of interviews. The 35 codes were then reduced to 25 to diminish redundancy and overlap (Thomas, 2003). After the 5 group interviews were coded, the 25 codes were grouped by similarity, thus producing a theme for the grouping (Leech & Onwuegbuzie, 2007).

Code lists were generated from Atlas.ti., creating a codebook to ensure consistency of coding throughout the interviews. Using codebooks employs the constant comparative method (Glaser & Strauss, 1967) of qualitative data analysis, allowing researchers to systematically compare new text with text that has already been coded to ensure that later data are coded similarly to earlier data. The codebook was constantly modified and updated when new codes were discovered. As three data coders were involved in the group interview transcription analysis, the use of a codebook provided consistency among coders. For the current study, the codebook included a current list of every code, categories of codes, and definitions of codes. After each interview was coded, the three researchers met to compare coded transcripts, thus establishing intercoder agreement (Zhang & Wildemuth, 2009).

Trustworthiness of the study was established through investigator triangulation (Cresswell, 1998) with the use of three data-coders (Goodwin & Compton, 2004; Meadows & Morse, 2001). Investigator triangulation was accomplished using multiple researchers with a background in PA knowledge, qualitative inquiry, and interview technique to analyze the recordings from the group interview sessions to determine themes of responses. After each group interview was conducted, researchers debriefed and clarified their initial thoughts related to participants' responses (Jones et al., 2009). Few disagreements between coders occurred ($N = 2$) but were dealt with on a case-by-case basis and did not affect significant pieces of data. In addition, one "critical friend" with a background in PA research and with no involvement in the current study also reviewed the coding submitted by the investigators to ensure that coding was consistent throughout the group interviews. To accomplish this, the "critical friend" was given the research objectives of the current study as well as the text previously coded by the three researchers and then tasked with verifying the consistency of the coded data. In an attempt to further triangulate the data and increase trustworthiness, a stakeholder check was used in which four individuals with a brain injury who met the same inclusion criteria were given the opportunity to review researchers' coding of previous participants' responses from previous group interviews (Thomas, 2003). The individuals participating in the stakeholder check supported the researcher's findings.

Results and Discussion

The four broad categories used to facilitate discussion during the group interviews included participants' (a) knowledge; (b) attitudes and expectations; (c) wants, intentions, and perceived motivations; and (d) barriers. Through the data analyses, five higher level meta codes emerged: (a) knowledge of PA, (b) experiencing and overcoming barriers, (c) motivation and importance of PA, (d) expectations of PA, and (e) past, present, and future PA levels (see Table 3). The higher level items of the hierarchy, while broad in nature, were made up of lower level items that included

Table 3 Meta Codes, Codes, and Representative Quotes

Meta Codes	Codes	Freq.	Example of Quote
Knowledge	Positive attitude to PA	26	"If I wasn't as active, I wouldn't have recovered as fast."
	Achieving PA	10	"I think 3 × a week, 20-30 min a day is realistic."
	Age factor	5	"I want to stay fit, stay young."
	General knowledge	41	". . . got my heart rate up to 155 frequently."
	Lack of PA knowledge	22	"I don't know what the national guidelines are [for being physically active]."
	PA knowledge	63	"Anything that you would do that would exert force upon your body."
	PA characteristic	8	"breaking a sweat"
	Accuracy of self-report	4	"I'd say about 40 hours [of PA] per week."
	PT vs. PA	10	"PT is for recovery, PA is recreation."
	PA at work	6	"I'm a firefighter, I have to be in good shape."
Barriers	Goal-setting	16	"I have one goal: to get better."
	PA barriers	38	"Right now, it's [barrier's] my injury, but in the past, it was [transportation]."
	Overcoming barriers	24	"I'll be physically active with my limitations."
	Post-injury changes	12	"I'm limited to what I can do."
Motivation	Importance of PA	31	"If I hadn't been in the shape I had been in, I wouldn't be here."
	Motivation	33	"I want to get better. I want to get 100%."
	Self-efficacy/ confidence	2	"Balance and coordination: I'm very proud of that because if you can do that, you're back on the road to normalcy in my mind."
	Social support	17	"I feel like my family is going to help me out with that [PA]."
	PA safety	12	"Everybody says I shouldn't [be active]."
Expectation	Access to PA	2	"In the gym, on the lake, Colorado, the ocean."
	PA expectations	22	"get somebody back into their old way of living."
	Expected PA benefits	32	"to get more energy, to relieve stress."
	PA needs	5	"Motivation, time."
Intention	Pre-injury PA	21	"Before the injury, I played tennis, did ballroom dancing."
	Present & future	38	"It's important to me to stay fit, stay on top of it."

direct quotes from the individuals in the study that were coded during analysis of the group interview transcriptions.

Knowledge of Physical Activity

Participants' knowledge of PA was determined through their level of understanding of the benefits, characteristics, and types of activity. An individual's knowledge level of PA is important, especially during rehabilitation, because it may help to encourage participation in PA, thus allowing participants to experience health benefits from being active (Reavenall & Blake, 2010). Group interview participants who exhibited "general knowledge" of PA demonstrated a moderate level of PA understanding (e.g., what PA is, the benefits, and examples of activities). When asked what types of PA people should conduct, participants identified activities with characteristics such as "whatever breaks a sweat," something that gets "my heart rate up to 155 frequently," and "anything that you would do that would exert any kind of extraordinary force upon your body." Similarly, another participant also stated "anything that is going to get your heart to react in a healthy way is better than sitting there and doing nothing." As a whole, participants were able to list activities and characteristics that would be considered as PA, and knew that it was something that they should do, even if they didn't do it. In addition, a handful of participants were able to list health-related benefits of PA such as stress reduction, better sleep, weight control, decrease in fatigue, increase in life longevity, increase in happiness, improved self-image, and prevention of hospital visits. Knowledgeable participants also discussed what makes up or defines PA and stated characteristics of PA such as "getting your heart rate up," "breaking a sweat," and "getting muscles." Another person went into further detail:

[PA is] anything that involved you moving your body. Anything besides sitting down or watching TV or getting on the computer. So any sport, something.
Male 3

When asked what were examples of PA, participants commonly listed activities such as running, playing sports (e.g., football, basketball), lifting weights, walking, and cycling.

Five participants demonstrated a lack of PA knowledge and uncertainty of what constitutes PA, however. For example, when asked what the top three benefits of PA are, one participant responded: "I just assumed it was doing something good for me" while another replied "I don't know, what are they? I mean, are there three [benefits]?" The majority of other responses demonstrated a lack of PA knowledge expressed by responses such as "I don't know" or "I can't come up with it [a benefit of PA]" and guessing/uncertainty sounds such as "um" and "uh."

Nearly all participants believed that PA was something that should be part of their outpatient rehabilitation and discussed "overall wellness" as a benefit of PA, however. In fact, two individuals recognized the role that their premorbid level of PA played in their recovery: "I don't think that I would have recovered as fast if I hadn't been in as good of shape" (Female 1, Table 1) and "If I wasn't as active [before], I wouldn't have recovered as fast" (Male 1). Similarly, one participant discussed PA as a tool to prevent future surgeries, while another felt that it prevented depression. In addition to attributing in part their recovery to PA,

participants also identified PA as something that is done for fun, or is enjoyable: "It's [PA] a great way to just release and makes my body feel good" (Female 2). Finally, nearly every participant demonstrated a desire to be active, even if they had not been pre-morbidly and declared that they would be active despite the physical limitations caused by the injury. The fact that participants demonstrated a positive attitude has encouraging implications for HPP implementation and the adoption or maintenance of PA throughout rehabilitation, with findings being supported by previous research reporting that individuals with a TBI had a positive attitude to PA (Driver, 2009; Wise et al., 2010).

When evaluating participants' knowledge of the benefits of PA, there seemed to be a different level of importance placed on PA between older and younger individuals. For example, one 18-year-old male participant differentiated between the PA benefits of the young and old stating: "[Benefits of PA] for kids, less chance of becoming obese or something. For adults, less chance for heart attack or anything that would cause problems" (Male 3). Attributing the health benefits of PA as something that is only important to older individuals is notable as Male 3 considers appearance (or the desire to be lean versus being overweight or obese) the most important benefit of PA for himself and his peers (and not the secondary health conditions associated with obesity). Similarly, when asked for the health benefits associated with PA participation, a fifty-one year old female participant dismisses the risk of health problems attributed to inactivity in youth:

I'm 51, she's [female 3; 20 years old] still young. At this age, it's [being active] to make sure that I'm not in a wheelchair the rest of my life. . . . I have a high energy level and there's still a lot of things that I want to do and see, so I have to stay healthy to do that. In addition, the #1 [benefit associated with PA] is the weight benefit, at least for women anyway. . . . I think that affects the health of your body too. Overweight people tend to have more health risks. You know, they have high blood pressure, high cholesterol. If you're exercising, you're not sitting in front of the TV eating . . . which a lot of people tend to do, everything's healthier. Female 4

Similarly, a 61-year-old participant also stated, "As you get older, you learn [the importance of PA]. 'Move it or lose it.' And that is so true. So true. So I'm moving it" (Female 2). This is consistent with previous research among older adults who typically focus on the health benefits as a reason to be physically active (Henwood, Tuckett, Edelstein, & Bartlett, 2011).

The disconnect between the perceived health benefits of PA based on age is further demonstrated in another group interview of young males (ages 18 and 23) when both participants stated that weight, strength, and endurance are the most important PA benefits to them. When asked why these benefits were important to them, they answered that their main concern is to "stay fit, stay strong" (Male 11) and that "[they] want to be able to play football again, play sports. And being strong and having good endurance . . . I mean, I'll lose weight doing that, but that's not my main concern" (Male 12). Further, they stated "I don't work out to be healthy, I just do it for fun" (Male 3). It can be interpreted from these statements that these young male participants are more concerned with the present (e.g., appearance, recreation time, enjoyment, etc.) than they are with the long-term health effect of PA (e.g., decreased BMI, heart disease).

Perhaps one of the most interesting areas of responses was some participants' knowledge of the difference between PA and physical therapy (PT). When comparing PA to PT, individuals typically did not mention the health benefits of PA (e.g., decreased risk of mortality or morbidity), but saw PT as a means of "recovery." For example, "PT is for recovery; PA is recreation" (Male 1) and "PT teaches you how to be physically active again. It teaches you how to be mobile or independent. PA is like things you do for fun or to strengthen your body" (Male 3). The view that PA is for "recreation" or "fun" suggests that participants do not fully understand the health benefits associated with participation and the role that PA can play in "recovery" and in improving "mobility and independence" postinjury. Individuals were, however, typically knowledgeable about the role of PT in the rehabilitation process, perhaps because at the medical center where participants were recruited, time is set aside each day for individuals to work both alone and as a group in PT. These learning and practice opportunities do not happen for PA. It is possible that this additional experience left individuals with the impression that PT is more important to health than PA. This is epitomized in the following response from a 61-year-old female participant:

[In physical] therapy, they [therapists] usually work on things you have a problem with. Like I have a new leg from my knee down and a titanium rod. Before PT, I couldn't even walk on it. And it was "bend your foot, lift your butt". . . you know, things you need to do to keep in shape or you'll need to be able to get dressed to make your life easier, make your recovery better. That's a lot different than when I think of PA, which sometimes can be for fun or because you're working out, trying to get your PA in. PT is geared more toward you as an individual and what your needs are or are going to be. Female 2

Conversely, an eighteen-year-old male participant stated "For me, PT is just getting me back to the point where I can do PA again. I don't know, they gave us a sheet [the Think S.A.F.E. list] that's basically 'you can't do PA.'" It says we can jog, but can't do serious PA for a year. So, if I can't do serious PA for a year but am allowed to do this therapy stuff, then it's [PT] the building blocks of getting back to being able to do that" (Male 7).

Experiencing and Overcoming Physical Activity Barriers

PA barriers were defined in this study as what kept participants from achieving their goals (Lox et al., 2003). These barriers could be personal (e.g., motivation) or environmental (e.g., accessibility). Most individuals in comprehensive outpatient rehabilitation are limited to how much and what kind of PA they are permitted to participate in due to the nature of their injury (Reavenall & Blake, 2010). For individuals in the current study, certain PA is restricted through the use of the "Think S.A.F.E." list, which prevents high impact activities such as running or contact sports like basketball. Specifically, the Think S.A.F.E. list was designed at the medical center where participants were recruited from and is used to define what is considered safe and unsafe PA for individuals to participate in post-TBI (e.g., no high impact activities such as contact sports for one year). This list of precautions is reviewed and discussed between patients and therapeutic recreation specialists or nurses to "help protect against future injury to [patients'] heads." Consequently,

most participants referenced the precautions listed in the Think S.A.F.E. list as barriers that prevent them from being physically active. For example, when asked if PA is something that should be done as part of their rehabilitation, one participant stated “yes and no, because you can get really hurt doing PA” (Male 3). Six other group interview participants referenced the Think S.A.F.E. list that “basically states you can’t do PA” (Male 7) and that participants are “just trying to figure out safe things [they] can do” (Male 11). As numerous participants similarly justified their inactivity with the Think S.A.F.E. list, it is possible they may be living an unnecessarily inactive lifestyle. Potentially, individuals in outpatient rehabilitation may be completely restricted from PA, but it is unusual. Thus, this apparent misinterpretation of the Think S.A.F.E. list as something that limits all PA may cause individuals to be overly cautious or intimidated by PA and, therefore less likely to be active. Notably, several participants expressed a desire for a more positive way to restrict PA among individuals enrolled in outpatient rehabilitation, such as a list that details their participation limits. However, this general trend that individuals are less active post-TBI is supported by the literature which reports reduced MVPA (Driver, Ede et al., 2012) and participation in leisure activities (Fleming et al., 2011; Wise et al., 2010).

Though it seems that the Think S.A.F.E. list may limit individuals’ PA, participants’ injury was the most reported barrier to PA participation. This is demonstrated in statements such as “everybody says I shouldn’t [due to injury restrictions]” (Male 3), and “I can’t drive [to places to be physically active] because I had a seizure” (Male 9). Often, individuals have had lasting effects from their injuries such as being “in a coma for like three weeks . . . and [losing] over forty pounds” (Male 5) that inhibited their ability to be physically active, while other participants “physically can’t [be active]” due to assistive devices (e.g., halo braces; Male 9).

Personal barriers to PA were not limited to physical restrictions, as several participants mentioned personal and environmental barriers. Specifically, busy schedules, health (e.g., asthma), depression, laziness, work, school, and family were cited as barriers. Environmental barriers identified included accessibility (e.g., “I don’t have access to a gym,” Male 2) and transportation (e.g., “You can ask people to take you, but you get tired of having to ask,” Female 3). One participant also spoke of nervousness when speaking to therapists in that they “weren’t sure if [they] wanted to ask them about that [PA]” (Male 4). The personal and environmental barriers reported are consistent with previous findings specific to adults with a TBI (Driver, 2009; Driver, Ede et al., 2012). For example, Driver, Ede and colleagues (2012) found that lack of an accessible facility and lack of time were two of the most reported barriers.

Due to the large number of potential barriers that would prevent individuals with a TBI from being physically active, it is important to develop strategies for overcoming these barriers. For example, when participants stated that they did not have access to facilities such as gyms or weight-rooms, they mentioned they may do exercises that do not require equipment in and around their homes (e.g., pushups, pools, and walking). Five participants did, however, state that they had transportation issues. If transportation was a barrier, though, most participant’s recognized the importance of PA and were willing to walk or ask for a ride: “There’s still one [gym] pretty far, but I can walk it. There aren’t any excuses for me” (Male 3).

Motivation and the Importance of Physical Activity

In the current study, “Motivation” was defined as what kept participants wanting to improve their state of being (Lox et al., 2003), while “importance of PA” was used to code participant responses that included discussion of health as a part of their rehabilitation. Goal setting is an integral part of rehabilitation programs, with the primary goal being to improve the individual’s quality of life postinjury (Dalton et al., 2012; McPherson, Kayes, & Weatherall, 2009). The importance of this is demonstrated when over half of participants indicated their main goal was to return to their preinjury lifestyle and ability level. For example, participants identified wanting to get back to activities such as walking, weightlifting, playing football, boxing competitively, and staying in shape. One participant’s long-term goals included “to get back to where I was, at my skill level” (Male 3), while another summarized the sentiment, “I have one goal: to get better” (Male 1). Perhaps most notable, however, were the participants’ acknowledgment of the difference between their goals preinjury versus their goals postinjury. Specifically, when asked what role PA plays in helping patients overcome secondary health issues, one participant responded “I had goals before the injury as far as PA and those kind of got changed and the road redirected so I want to get back to those and that’s a pretty serious motivator so I can either get back to those goals or make new ones” (Male 7). In addition, a participant in a later group interview spoke of the “reality and realization that it [his previous goals] wasn’t going to happen” (Male 7). These realizations signify an important step in the rehabilitation process, which is acceptance of injuries and changes in ability. Specifically, previous PA goals may no longer be feasible, but old goals can be replaced with new goals.

Notably, two participants discussed the importance of PA as they attributed their recovery to their preinjury activity levels. A younger male participant (age 25) stated, “They gave me a 1% chance to live [after a resulting three-week coma due to the TBI] and they pretty much told me that if I hadn’t been in the shape I had been, I wouldn’t be here” (Male 5). In addition, a 61-year-old female participant whose injury was attributed to a fall at home stated the following:

Well, I’m older than both of them (the two male participants in the group, ages 25 and 30), but as you get older, it’s [PA] so important. I mean, if all of this had happened to me and I had been overweight, not in good shape, not in overall good health, I probably wouldn’t be sitting here. I mean, it was that close. . . . I just hope to be a source of encouragement or inspiration for some of my friends here and people that I know because it’s [PA] just so important. You don’t come out of this [TBI] on the other side with what you came into it with. Female 2

As a whole, participants’ main motivation to be physically active was to return to their preinjury lifestyles. For example, when participants were asked if they had the motivation to be physically active, responses were very consistent with this individual’s sentiment: “I want to get better. I want to get to 100%” (Male 1). In addition to returning to “100%,” participants also used enjoyment of PA (e.g., “I just do it for fun”), social influences (“[I do it for] my kids” or “my mom”), and their career (“My job requires me to be physically active”) for motivation to be active. One individual specifically cited the health benefits from PA as a motivating factor to be active:

It [PA] helps stress-wise, get better rest at night, take care of your needs, not stressed, not worried about things, helps burn calories, helps live a healthier life, helps with a lot of things. Kind of calms you down, mellows you out I use it for that reason. It works for me to work out and stuff. Burn stress and not to mention calories and not to mention other necessary things. Male 6

Another participant also reported energy gains from being active as a motivating factor: “I like doing physical stuff in the morning, because that keeps me charged up during the day” (Female 2). In addition, participants also reported that they felt that regression in their rehabilitation was an important factor to avoid: “All the progress I’ve made in rehab, if I don’t keep it [PA] up and pump it up, it’s just going to set me back and that’s not going to happen” (Female 2).

Participants cited several sources of social support including friends, significant others (e.g., husbands, boyfriends, etc.), roommates, parents, coworkers (“firefighting buddies”), teammates, and peers. These sources are consistent with those cited in previous brain injury research, whereby family members, friends, and caregivers were most influential on PA behaviors (Driver, 2005, 2007). Most participants stated that social support “plays a big part” in being physically active, though some were confident in their motivation to keep them active: “I need support from others . . . but really, I’ll be physically active no matter what” (Male 10). One participant not only discussed her own desire to be physically active, but also extended this desire to “get my husband inspired to walk again” (Female 2). This statement suggests that participants may also consider themselves a source of social support to others around them.

Some significant others provided negative social influences. For example, a 61-year-old female cited her mother as being a source of negative modeling: “I came from a family of four sisters . . . my mother was heavy, and she always said ‘If I haven’t taught you anything else, I’ve taught you what not to do’” (Female 2). This finding emphasizes the fact that social influences can be positive or negative (Driver, 2005), which is consistent with a multidimensional conceptualization of the social influence (Chogohara, O’Brien Cousins, & Wankel, 1998).

Expectations of Physical Activity

For the purpose of this study, expectations were defined as what participants anticipated to gain from being PA, while intentions were participants’ determination or purpose for being PA (Lox et al., 2003). The participants’ expectations for PA included outcomes such as “lower cholesterol, lower weight. I’m very convinced lately of the long term mental benefits of PA” (Female 1). Others expected to “get back into [their] old way of living” (Male 3) as a result of being physically active postinjury. One individual responded in this manner stating that “if you don’t really work out and take care of yourself, your body isn’t going to respond the way you want it to [in rehabilitation]” (Male 5). Another participant went into further detail and demonstrated a realistic perception of their recovery expectations: “it will probably take a year or a couple months to get back to where I was” (Male 3). Participants also had different expectations in regard to the amount of PA that should be completed per week to receive health benefits. For example, when asked if it is realistic for someone to complete 150 min per week of PA, one participant replied, “well, over the year, yes, but not in like a week or something” (Male 3).

This not only demonstrates a misunderstanding of the expectations for amount of PA per week to gain health benefits, but also inactivity in their own life.

The increased feeling of energy (both mental and physical) that results from PA participation was also described as an important health expectation of group interview participants. Extra energy is especially important in the rigorous rehabilitation setting due to the intense structure of therapies and classes in which individuals participate, as outpatient rehabilitation is often tiresome (Ylvisaker & Feeney, 1999). Because outpatient rehabilitation is the first step toward living independently after several weeks or months of inpatient rehabilitation (where participants were often heavily medicated), participants are coming out of the medication “fog” during comprehensive outpatient and commonly express feeling extreme fatigue (Ylvisaker, Jacobs, & Feeney, 2003). One participant spoke specifically about fatigue during her hospitalization, as well as the benefits of PA:

With brain traumas, which we’ve all had, if you’re mentally fatigued, I mean just being awake and around people, and if I didn’t have the physical exercise to go along with that, I would be even more tired. So it’s a great way to just release and makes my body feel good like it’s doing something because mentally, I don’t always know! Female 2

She elaborated further stating that “I’m exhausted by Friday afternoon (after a week of outpatient rehabilitation) but if I wasn’t doing all that [PA], I’d be tired by Tuesday” (Female 2).

When group interview participants were asked what they expected they would need to be active, common responses included social support, transportation, motivation, time (if they are restricted from PA due to their injury), a place to be active, and equipment. When participants were asked where they expected to be physically active, they frequently cited home and nearby gym facilities. Most participants stated that they would improvise locations to be physically active when accessibility to sites was limited, such as this 25-year-old male who stated, “It [accessibility to PA] depends on where I’m at. In the gym, on the lake, Colorado, the ocean. Wherever I’m at, I’m going to be doing something active” (Male 5).

Participants’ Past, Present, and Future Physical Activity Levels

During the course of each group interview, participants were asked how much PA they completed per week. Most participants reported to be active 2–3 hr per week, though three participants stated that they counted the time they spent at their job as activity time. Participants often stated that they were unsure of how much PA they completed per week, while it is probable that others greatly over-estimated their estimate: “I’d say per week about 40 hours” (Male 3).

For the purpose of this study, the code “Present and Future Intention” was used for responses that indicated what participants hoped to achieve as a result of being active. Most participants recognized the importance of PA after their injury and one participant claimed that “It’s [PA] even more important to me [post-injury] to stay fit, stay on top on it” (Female 1). Perhaps it is because of this newly increased sense of importance to be active as a result of their injury that participants stated that they “were never going to stop working out” (Male 5) and that they “want to

do it everyday to be good” (Male 7). It is notable that even if participants believed they were not sufficiently active before their TBI, they found PA postinjury beneficial. When asked if a participant intended to be physically active once they left the outpatient rehabilitation environment, a 21-year-old male responded that they wanted to be “more [PA] than I am now” (Male 8). Another individual also discussed how he can make time for PA in his busy schedule: “I have two jobs and am writing a thesis and taking full loads of courses right now; it’s [PA] not really a priority. So I guess that would be the first step: making it a priority” (Male 9). In addition, participants also intended for their PA during rehabilitation to return them to their PA levels preinjury. For example, “[PA] will take me to where I want to be” (Male 12) or “I want to be back to bench-pressing 300 pounds like I was before my injury” (Male 10).

Implication for Practice

As previous research has identified the positive effect that a PA based HPP can have on individuals with disabilities (Abdullah, Horner-Johnson, Drum, Krahn, Staples, Weisser et al., 2004; Ravesloot, Seekins, & White, 2005; Rimmer, Braunschweig, Silverman, Riley, Creviston, & Nicola, 2000; Stuifbergen, Becker, Blozis, Timmerman, & Kullberg, 2003), a program for people with a TBI is warranted. Thus, results also have significant implications for the development and implementation of a HPP. First, during the course of the five group interviews, participants as a whole demonstrated a positive attitude toward PA. As a result, the implementation of an education based PA HPP for individuals enrolled in outpatient rehabilitation may be well received by participants (Driver, Ede et al., 2012; Driver, Irwin et al., 2012). Even though participants expressed a desire to be active, they were not completing enough PA based on national recommendations (Centers for Disease Control and Prevention, 2011). Participants consistently reported that they did not engage in sufficient amounts of PA, emphasizing a lack of understanding regarding how much activity is required to receive health benefits. To increase the amount of PA completed, education based HPPs that increase participants’ understanding of the PA requirements are needed.

Second, though participants did exhibit a positive attitude toward achieving the recommended amount of PA, they were often unsure of what constituted PA and how much PA was necessary to receive benefits. Due to this lack of knowledge, it is important for HPP to include instructional pieces to educate participants of what constitutes PA, what the national guidelines for PA are, and what the benefits of PA are. Therefore, HPPs should include an educational component that focuses on defining PA, the requirements of PA (specifically how much PA/week is necessary to receive health benefits), and local PA resources available to participants (e.g., YMCAs). As participants demonstrated an inability to distinguish the characteristics of what constitutes PA, it is clear that individuals need to know about the types of PA that they can participate in postinjury, as many activities are not appropriate.

Third, based on PA-related goals from participant responses, HPPs should focus on assisting individuals in recognizing that preinjury goals may need to change postinjury, which is consistent with goal setting recommendations in the general TBI rehabilitation literature (McPherson et al., 2009). Modification of the Think S.A.F.E. list to include permitted activities may result in increased PA

among individuals with a TBI. An individualized list of safe activities is also recommended based on group interview participant responses. By focusing of what individuals can do instead of what they cannot, environmental (e.g., accessible fitness facilities, transportation, etc.) and personal barriers (e.g., motivation, time, etc.) may be overcome.

Finally, due to perception of age differences present in outpatient rehabilitation (ages ranging from 18 to 62), it is important to relate PA to rehabilitation outcomes (e.g., increased energy, decreased depression, increased range of motion, improved mobility) rather than age specific objectives. Consequently, HPPs should assist participants in finding motivating factors that are not limited to age, such as weight control or cholesterol levels.

Limitations to this study may include the fact that due to the nature of outpatient rehabilitation, it was necessary to use a purposive sampling method, rather than random sampling, to assure that participants were considered to be sufficiently “high cognitive functioning” (e.g., memory recall, attention, independent thinking) to take part in the group interviews. These patients also experienced variable length of stays in outpatient rehabilitation, which may have an impact on their PA knowledge, intention, and expectation.

Results from the current study will enable specialists in the future to create meaningful PA-based HPP for adults with a brain injury. If the HPP is appropriately designed, previous research suggests that participants will be more likely to adopt and maintain PA behavior, experience fewer secondary or chronic conditions and greater quality of life, and have decreased healthcare costs (Abdullah et al., 2004; Ravesloot, Seekins, & Cahill, 2007; Ravesloot et al., 2005; Rimmer et al., 2000; Rimmer & Rowland, 2008). Thus, as clinicians in TBI outpatient rehabilitation look for ways to improve the functioning of people with a TBI, the findings of this study provide basis for HPP development to improve the lives of individuals after TBI.

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