Ethnic identity as a predictor of community integration following traumatic brain injury

Jennifer Peraza
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Abstract
Researchers have found differences between racial groups for outcomes following traumatic brain injury (TBI); however, no study has examined variables that might explain differences between racial groups or that may identify potential protective and risk factors. Ethnic identity has been found to be related to positive outcomes such as self-esteem and quality of life, especially for racial minorities. Therefore, the current study used hierarchical regression analyses to investigate the predictive power of ethnic identity on community integration after TBI, after controlling for other significant variables, for 58 TBI survivors (82.8% Caucasian). Contrary to hypotheses, race and ethnic identity were not predictive of community integration for this sample; however, greater levels of current cognitive and physical problems significantly predicted less community integration ($p < .05$). These results support previous research findings about the impact of disability on outcomes after TBI. The impact of disability as a diversity variable, as well as the intersection between race and disability, are discussed in the context of a limited racial minority sample.

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ETHNIC IDENTITY AS A PREDICTOR OF COMMUNITY INTEGRATION FOLLOWING TRAUMATIC BRAIN INJURY

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Researchers have found differences between racial groups for outcomes following traumatic brain injury (TBI); however, no study has examined variables that might explain differences between racial groups or that may identify potential protective and risk factors. Ethnic identity has been found to be related to positive outcomes such as self-esteem and quality of life, especially for racial minorities. Therefore, the current study used hierarchical regression analyses to investigate the predictive power of ethnic identity on community integration after TBI, after controlling for other significant variables, for 58 TBI survivors (82.8% Caucasian). Contrary to hypotheses, race and ethnic identity were not predictive of community integration for this sample; however, greater levels of current cognitive and physical problems significantly predicted less community integration ($p < .05$). These results support previous research findings about the impact of disability on outcomes after TBI. The impact of disability as a diversity variable, as well as the intersection between race and disability, are discussed in the context of a limited racial minority sample.
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Ethnic Identity as a Predictor of Community Integration Following Traumatic Brain Injury

According to the Centers for Disease Control and Prevention (CDC, 2010) 1.4 million people experience a traumatic brain injury (TBI) in the United States each year. Further, about 235,000 people who experience TBI are hospitalized, 1.1 million are treated and released from emergency departments (ED’s), and 50,000 do not survive the injury. Recovery from TBI spans various domains of functioning including cognitive, physical, emotional, and social. There are a variety of ways an injury such as TBI can affect a person’s life. Certainly functional and cognitive abilities can be an affect, but other psycho-social variables should be considered as these reflect how an individual integrates residual deficits into daily life. One such variable that integrates several areas of functioning is community integration. Community integration spans across several domains and refers to participation in community activities such as involvement with family, friends, home activities, and employment, volunteerism, or educational programs (Dijkers, 1997). Differences for treatment and outcome have been found between racial groups for a variety of outcome variables, including community integration (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Hart, Whyte, Polansky, Kersey-Matusiak, & Fidler-Sheppard, 2005; Rosenthal et al., 1996). Differences between racial groups persist even when other demographic variables are controlled for in analyses.

No study has investigated why differences between racial groups emerge. Ethnic identity is one such variable. Ethnic identity can be defined as “that part of an individual’s self-concept that derives from his or her knowledge of membership in a social group (or groups) together with the value and emotional significance attached to that membership” (Phinney, 1992, p. 156). Researchers have found ethnic identity is related to better quality of life, life satisfaction, and
self-esteem for non-clinical groups. The current study attempts to investigate the relationship between ethnic identity and community integration for survivors of TBI.

**Community Integration**

Community integration refers to participation in community activities such as involvement with family, friends, home activities, and employment, volunteerism, and educational programs (Dijkers, 1997). Researchers have investigated community integration among individuals with TBI (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Brown, Gordon, & Spielman, 2003; Bushnik, Hanks, Kreutzer, & Rosenthal, 2003; Colantonio et al., 2004; Corrigan & Deming, 1995; Gerhart, Mellick, & Weintraub, 2006; Harrison-Felix et al., 1998; Hart et al., 2005; Heinemann & Whiteneck, 1995; Huebner, Johnson, Bennett, & Schneck, 2003; Linden, Crothers, O’Neill, & McCann, 2005; Reistetter & Abreu, 2005; Rosenthal et al., 1996; Schmidt, Garvin, Heinemann, & Kelly, 1995; Willer, Ottennbacher, & Coad, 1994). Often comparisons are drawn between a sample of individuals with TBI and a comparison group either consisting of individuals from the general population or individuals with an acquired disability other than TBI. The majority of research focuses on outcome at one year post injury; however, there is some research assessing retrospective premorbid levels of community integration as well as long term outcome.

Willer et al. (1994) conducted exploratory analyses comparing individuals with and without TBI using the Community Integration Questionnaire (CIQ; Willer, Rosenthal, Kreutzer, Gordon, & Rempel, 1993). The CIQ was administered to 341 individuals with TBI and 211 individuals without TBI or known disability. The authors found TBI survivors had significantly lower scores of community integration on the total score and all three subscales (i.e., Home,
Social, and Productivity) compared to individuals without TBI. The authors concluded that survivors of TBI had poorer community integration compared to controls.

Similarly, Corrigan and Deming (1995) conducted a cross-sectional study using retrospective premorbid community integration. They administered the CIQ to participants on admission to rehabilitation to assess retrospective community integration and at 3 to 6 months post injury to assess follow-up community integration. The retrospective premorbid community integration sample consisted of 104 patients with TBI and 357 patients with other disability including stroke, spinal cord, non-traumatic brain injury, orthopedic injury, neurologic injury and other injury. The follow-up community integration sample consisted of 46 patients with TBI and 171 with other disability. Group comparison analyses showed that premorbid levels of home, social, productive, and total levels of community integration were higher than at follow-up for both groups combined. For home integration, premorbid levels were greater than follow-up levels of home integration for both groups. However, when TBI and other disability groups were examined separately, the TBI groups showed no difference between premorbid and follow-up scores for home integration. For social integration, both groups showed significantly worse social integration at follow-up compared to premorbid levels. The TBI group had higher premorbid levels of social integration compared to the other disability group, although neither group differed at follow-up. Finally, for the Productivity subscale, premorbid scores were higher than follow-up scores for both groups; however, the TBI group had higher integration than the other disability group, both premorbidly and at follow-up. The authors concluded that post-injury levels of community integration for individuals with history of TBI decreased compared to premorbid levels, which is consistent with Willer et al. (1994) findings that TBI survivors have worse community integration than those without injury. The only exception in the Corrigan and
Deming study was for the Home Integration scale, on which TBI survivors showed no differences between premorbid and follow-up scores; however, the authors argued that their retrospective TBI sample reported significantly lower home integration compared to the other disabilities group, and the mean was also lower than that found in the Willer et al. sample.

Linden et al. (2005) also compared community integration between TBI survivors and individuals without injury. The authors administered the Community Integration Measure (CIM; McColl, Davies, Carlson, Johnston, & Minnes, 2001) to a sample consisting of three groups from Northern Ireland: 10 individuals with TBI, 10 male controls, and 10 female controls. It should be noted the group of TBI survivors consisted of nine men and one woman. TBI survivors did not differ from men of the normal population, whereas women of the normal population had significantly greater community integration levels compared to the TBI survivor group. However, the authors noted that the range of community integration scores was greatest for the brain injury group. Although the authors concluded that brain injury combined with male gender are risks for poorer community integration, they acknowledged these results should be interpreted with caution due to small sample sizes and heterogeneity in the brain injury sample in terms of injury characteristics, age, and gender.

In a study focusing on engagement in social-recreational activity, Brown et al. (2003) compared a sample of TBI survivors with individuals without disability. As part of a larger study, 279 individuals with TBI and 224 individuals without disability were interviewed using seven measures, some of which included the CIQ and Craig Handicap Assessment Reporting Technique (CHART; Whiteneck, Charlifue, Gerhart, Overholser, & Richardson, 1992). For the current study, five items about social-recreational activity were used, including in- and out-of-home activity as well as social participation. While accounting for various demographic
variables (i.e., age, gender, ethnicity, education, income, and marital status), results showed individuals from the TBI group had lower social-recreational activity compared to individuals without disability. Depressive symptoms were the greatest predictor of social-recreational engagement among individuals with TBI, such that greater depressive symptoms predicted less social-recreational activity. Other significant variables predicting more social-recreational activity for individuals with TBI included being single, greater income, more hours at one’s vocation, less fatigue, and longer time post injury. Only being single and greater income were common predictors between the TBI and control group. The authors concluded that individuals with TBI are less likely to be involved in social-recreational activities than individuals without disability.

Researchers have investigated long-term community integration for survivors of TBI as well. Colantonio et al. (2004) examined the long-term psychosocial and functional daily activity outcome among individuals with moderate to severe TBI 7 to 24 years post injury. They interviewed 306 participants contacted by accessing medical records from a rehabilitation treatment center in Pennsylvania (20 were informants for individuals that could not be interviewed due to physical, cognitive, or communication limitations). Review of medical records and interviews were used to obtain information on pre-injury characteristics, injury severity variables, post-injury variables, and outcome variables. One outcome variable assessed was community integration as measured by the CIQ. The authors reported overall means of the total score as well as subscales of the CIQ reflected poor community integration. They found these results were similar to other studies with similar samples of individuals with TBI (Schmidt et al., 1995) and lower than scores found in the normal population. The authors concluded that community integration is an ongoing concern for survivors of TBI.
Overall, individuals with TBI have poorer community integration following injury. Limited research assessing premorbid levels suggest community integration is negatively affected by the experience of TBI. Also, these effects appear to be long lasting, as there is evidence of impaired community integration several years following injury.

Predictors of Community Integration Outcome

Researchers have investigated several predictors of community integration. In a systematic literature review, Reistetter and Abreu (2005) found the most prominent predictors of community integration among survivors of TBI included severity of injury, age, gender, education, prior work, prior living arrangement, cognitive and emotional status, functional performance, and disability. Additionally, etiology of injury, specifically violent versus non-violent cause of injury, is predictive of community integration; however, many other demographic variables also are associated with etiology of injury (Bushnik et al., 2003; Gerhart et al., 2006; Harrison-Felix et al., 1998). The following is a review of literature investigating various common injury and demographic characteristics found to be predictive of community integration among TBI survivors.

Functional performance and disability. As would be expected, and hoped, improvement during rehabilitation is associated with better outcomes. Huebner et al. (2003) investigated the predictive quality of rehabilitation on community integration, activity limitation, and quality of life for 25 survivors of TBI. The Functional Independence Measure (FIM; Uniform Data Set for Medical Rehabilitation) was administered at admission and discharge to rehabilitation. A change score for FIM from admission to discharge was calculated to infer improvement during rehabilitation. Community integration was measured using the CIQ. Activity limitation was measured using the Activity Limitations Survey (ALS) a portion of the
Health Activities Limitations Survey (Statistics Canada, 1989). Quality of life was measured using the Quality of Life Rating (QOLR; as cited by Huebner et al., 2003). Outcome measures were administered, on average, 21 months post injury. Scores on FIM at admission, discharge, and change over rehabilitation were used to predict outcome. Change in FIM scores and FIM at discharge were found to predict community integration and activity limitation. Further, the authors examined the relationships among outcome variables. They found quality of life was associated with community integration. Also, less activity limitation was associated with higher scores on the total, Home and Productivity Integration scales, but not Social Integration. Less activity limitation and better social integration were correlated with quality of life, specifically aspects related to higher self-esteem, spirituality, and economic recreation. The authors concluded rehabilitation is predictive of long-term outcomes for individuals with TBI.

In a study focusing on impairment, disability, and handicap, as defined by the World Health Organization (WHO) International Classification of Impairments, Disabilities, and Handicap (ICIDH), Heinemann and Whiteneck (1995) examined the relationship amongst these variables and life satisfaction for 758 TBI survivors. The authors included various background variables (gender, age, educational attainment, and years since injury) in their investigation. Impairment, defined as “any loss or abnormality of psychological, physiological, or anatomical structure or function” (p. 54), was measured by duration of loss of consciousness (LOC). Disability, defined as “any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being” (p. 54), was measured by ratings (can or cannot do) for activities of daily living (ADLs) of eating, toileting, grooming, bathing, and walking. Handicap, defined as “a disadvantage that limits or prevents fulfillment of a role that is normal (depending on age, sex, and social and cultural
factors)” (p. 54), was measured by the three subscales from the CIQ (i.e., Home, Social, and Productivity). Researchers conducted multiple regression analyses using the following criterion variables: disability, home integration, social integration, productivity integration, and life satisfaction. Significant predictors of lower disability levels included less impairment, more years since injury, younger age, and higher levels of education. Significant predictors of better home integration included lower levels of disability, female gender, higher levels of education, and more years since injury. Significant predictors of better social integration included lower levels of disability, younger age, higher levels of education, and female gender. Significant predictors of better productivity integration included lower levels of disability, younger age, higher levels of education, more years post injury, and less impairment. Finally, significant predictors of life satisfaction included better social and productivity integration. The authors concluded that these results provided a better understanding of the relationship among impairment, disability, handicap, and life satisfaction, with impairment emerging as the strongest predictor of disability, which was in turn the strongest predictor of handicap (home, social, and productivity integration). Also, social and productivity integration predicted satisfaction with life. However, they also noted that other variables such as age, gender, education, and years since injury were important predictors of disability and handicap, stressing the importance of person and environmental factors.

Living arrangement. One environmental factor to consider is living situation following injury. Willer et al. (1994) compared community integration among 341 TBI survivors in three types of living situations: living independently (n = 57), living with community support such as a spouse or family member (n = 207), or living in an institution (n = 40). It was found that all three groups were significantly different on total CIQ score, such that those living independently had
the highest score and those living in institutions had the lowest score. The authors concluded that it is not surprising to find differences in community integration among TBI survivors in different living situations, and additionally this finding supported use of the CIQ in differentiating groups of more or less integrated individuals.

**Age and gender.** Person characteristics such as age and gender have been investigated in research on survivors of TBI. Schmidt et al. (1995) investigated the relationship of age and gender with community integration following brain injury. Participants (n = 758) were administered questionnaires, including the CIQ, and asked to answer in terms of their current functioning as well as functioning prior to brain injury, retrospectively. Age was categorized into six groups (i.e., 16-19, 20-29, 30-39, 40-49, 50-59, and >60). Group comparison analyses showed individuals from the youngest age group (16-19) had the highest scores for Social and Productivity subscales and individuals from the oldest age group (>60) had the lowest scores for the Social Integration subscale. Individuals in the groups ranging from ages 30-59 had the highest scores on the Home Integration scales. The authors also created change scores using retrospective and current ratings of community integration. Comparison of change scores showed that most age groups reported primarily negative changes, except the youngest age group (16-19), which reported mostly no or positive changes for community integration. In terms of gender, results indicated that women had higher community integration scores than men for the total score as well as Social and Home subscales. Men and women were equal on the Productivity subscale. However, comparisons of change scores between men and women showed women reported more negative changes than men, specifically regarding preparing meals, shopping, planning social activities, and independent completion of housework. Both men and women endorsed negative changes in money management and childcare (for those with children under
the age of 17). The authors concluded that both men and women showed declines in community integration following injury, although more women than men reported negative changes. The authors argued that this was consistent with cultural norms for many participants, as many items on the CIQ (e.g., housework, meal preparation, childcare) are consistent with social expectations for women. Schmidt et al. posited that premorbid familiarity with these tasks may also account for higher community integration scores post injury for women relative to men, especially with respect to home and social integration.

In a study discussed previously (Corrigan & Deming, 1995), a relationship was found between subscale and total scores from the CIQ with gender and age for individuals with history of TBI and individuals with other disabilities, both retrospectively for premorbid levels and at 3 to 6 month follow-up time. These authors found few correlations that accounted for more than 10% of the variance. In general, younger individuals had higher levels of community integration. Specifically, younger age was associated with premorbid Productivity and follow-up Social and total score for individuals in the other disability group. Follow-up social integration was associated with younger age in the TBI group. Also, premorbidly, women in the other disability group had higher scores on the Home Integration subscale. In contrast to other researchers, these authors concluded age and gender had limited effects on community integration.

**Etiology of injury.** Etiology of injury also plays a role in predicting outcome. Bushnik et al. (2003) conducted a study comparing differences across demographic, psychosocial, and outcome variables as a function of etiology of injury: motor vehicle collision (MVC), violence, falls, or other. The sample was collected from the Traumatic Brain Injury Model Systems (TBIMS), a national database, and included 1,170 participants who completed one-year follow-up data. Demographic variables included marital status, residence, gender, ethnicity,
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employment, education, and age. Injury characteristics included Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974) at admission to the ED and highest and lowest within first 24 hours, Rancho Los Amigo (RLA; as cited by Bushnik, 2000) Levels of Cognitive Functioning Scale classification at admission to hospital, duration of unconsciousness, duration of post-traumatic amnesia (PTA), and FIM score and Disability Rating Scale (DRS; Rappaport, Hall, Hopkins, & Bellaza, 1982) scores at admission to rehabilitation. Outcome measures included RLA classification at discharge from rehabilitation, FIM and DRS scores at discharge and one-year follow-up. Also, outcome measures at one-year follow-up included employment status, CIQ, and whether or not the participant had experience posttraumatic seizures. Group comparison analyses showed that, consistent with their hypotheses, individuals with a violent cause of injury were more likely to be African American, unemployed, unmarried, have used illicit drugs, and been arrested compared to the other groups. Individuals with a MVC cause of injury were most likely to be Caucasian, employed, not divorced, and without history of illicit drug use.

Bushnik et al. (2003) also compared groups at one-year follow-up. At this time, unemployment rate increased across groups, but the violence etiology group had the highest percentage of unemployed individuals compared to all other groups. However, change in employment status was not significantly different across groups. The MVC group had scores indicating better outcome on the DRS, FIM total, and FIM cognitive scales compared to the violence and falls etiology group. Finally, the MVC group had better outcome on total CIQ and Social Integration subscales compared to the three other groups. Individuals from the falls group had better social integration than the violence group. On the Home Integration subscale the MVC group had better outcome compared to the falls group only, whereas the MVC group had better outcome than did either the falls or violence group on the Productivity subscale. The authors
concluded that etiology of injury was related to outcome and that MVC and violence etiology were the most different, with means for the falls and other etiology group generally falling between the two groups on outcome measures, although most similar to the MVC group.

Gerhart et al. (2006) also investigated etiology of injury and outcome. They conducted a population-based study using the Colorado Traumatic Brain Injury Registry and Follow-up System (CTBIRFS) to compare individuals with violent causes of injury to those with non-violent causes for several characteristics including demographics, services used, and outcome. Chi square analyses showed that more individuals from the violent injury group were young, male, of a racial minority group, single, and had history of alcohol abuse, compared to the non-violent group. Logistic regression analysis found that the strongest risk factors for violent injury were history of alcohol abuse and being male, unmarried, and from a racial minority group. In terms of outcome, those with violent injuries were more likely to report more headaches, vision and taste disturbances, problems with confusion, attention initiation, and less community integration and societal participation (as measured by CHART-short form). Significant predictors for total CHART-SF score emerged, including (in order of association): employment at time of injury, severe GCS score, type of funding, injury severity, minority status, age, moderate GCS score, gender, marital status, violence-related injury, and multiple injuries. The authors noted that violence-related injury had the greatest predictive value for the mobility subscale of the CHART-SF. The authors concluded that outcome can be partly predicted by violent etiology of injury, but other variables such as age, gender, injury severity, marital status, and racial minority status also were important. The authors noted that “the same factors that predispose one to sustaining a violent TBI also affect the survivor’s outcome – his or her success in responding to and coping with that injury over the long term” (Gerhart et al., 2006, p.1051).
In a similar study, Harrison-Felix et al. (1998) investigated variables that may predict violent versus non-violent etiology of head injury and how violent versus non-violent etiology is related to outcome following injury. The authors collected data from 803 TBI survivors acquired from the TBIMS during the years 1989-1996. Etiology of injury was classified violent (self-inflicted or other inflicted) versus nonviolent (i.e., vehicular, falls, and other). As severity of injury was measured using GCS and duration of LOC. Finally, outcome measures included FIM scores collected at admission, discharge, and one-year follow-up from inpatient rehabilitation, and the CIQ at one-year follow-up. Group comparisons showed that those with violent etiology were more likely to be male, of a racial minority group, single at time of injury, less educated, living alone, living at “other than private residence” (e.g., homeless, living in a hotel), and to have had a positive blood alcohol level on admission to the ED. Of those employed at the time of injury, they were more likely to be in labor and service occupations. There were significant risk factors predicting violent etiology, including male, African American or other minority race, and nonproductive status at time of injury (i.e., unemployed). Age, residence (i.e., living in private residence, living in other than private residence such as homeless or hotel), education level, and marital status were not significant predictors. Individuals with violent injury etiology, compared to individuals with non-violent injury, had less severe injuries as measured by GCS and duration of LOC. The violent injury group also had shorter hospital stays, lower hospital charges, higher motor function on the FIM scores at time of admission to inpatient rehabilitation, and were more likely to be consuming alcohol at follow-up. They also had less community integration as measured by total CIQ scores, as well as lower scores on the Social and Productivity subscales. There were no differences between groups on the Home Integration sub-scale.
Harrison-Felix et al. (1998) also investigated predictors of outcome for TBI survivors. Pre-injury level of education and gender predicted home integration; however gender was no longer significant when socio-economic factors were included (e.g., race, education, premorbid productivity). Age, race, and education predicted social integration. Premorbid productivity predicted post-injury productivity. Violent injury was predictive of social and productive community integration but was no longer significant after socio-economic factors were entered. The authors concluded that risk factors for sustaining a violence-related injury in this sample were consistent with previous research and generally described “disadvantaged” individuals. The authors noted that despite violence-related injuries being associated with less severe injuries, both violent and non-violent etiologies did not differ on functional outcomes at one-year follow-up, although there were differences for community integration favoring non-violent injuries. However, etiology of injury became less prominent when socio-economic variables were considered (in particular race and productivity). The authors suggest that these factors, many of which also are risk factors for violent injury, explain community integration outcomes.

**Socioeconomic status.** Socioeconomic status is another important variable to consider. Descriptively, researchers have found that racial minorities tend to have lower incomes compared to Caucasians, although the relationship between socioeconomic status and outcome is yet unclear. For example, consistent with other researchers, Arango-Lasprilla et al. (2008a) found in their sample of TBI survivors, racial minorities were more likely to be male, unemployed, less educated, and to have sustained a violence-related injury. In addition, racial minorities had lower incomes compared to Caucasians. However, income was not a significant predictor of marital stability, which was the primary outcome measure in this study (the authors did not examine community integration). Rosenthal et al. (1996) investigated outcome among
TBI survivors and included family income as a variable. Racial minorities were found to have lower family income compared to Caucasians. They also found that racial minorities were more likely to be classified as having a “poor” payer, defined as having Medicare or Medicaid, health maintenance organization plans or plans using preferred providers, self-pay. Predicting community integration one-year post injury was significant for family income (along with several other predictors), such that individuals with lower family income also had lower community integration. Similarly, as part of a larger study comparing retrospective pre-injury data to data collected one-year post injury, Hart et al. (2005) found that income was lower for the African American group pre injury than the Caucasian pre-injury group, although the difference was not significant. However, at one-year follow-up, this difference was significant, with declines in income from pre to post injury being significant for African Americans but not for Caucasians. This prompted the authors to calculate correlations between income and items on the Social integration subscale of the CIQ that required spending money (e.g., going out). Although correlations were in the positive direction, they were not significant.

Overall, predictors of better community integration following TBI include various demographic and injury characteristics (Bushnik et al., 2003; Gerhart et al., 2006; Linden et al., 2005; Harrison-Felix et al., 1998; Hart et al., 2005; Heinemann & Whiteneck, 1995; Huebner et al., 2003; Reistetter & Abreu, 2005; Rosenthal et al., 1996; Schmidt et al., 1995; Willer et al., 1994). Specifically, less severe injuries, greater rehabilitation gains, and less functional impairment are related to better community integration. Also, higher levels of education, younger age, and female gender are predictive of better community integration, although there are some discrepant findings regarding age and gender. Premorbid work status is a predictor of work status post injury, which is reflected in overall community integration. Although increased
time post injury is related to better community integration, poor community integration is still evident at long-term follow up. Also, type of injury, especially violent versus non-violent etiology, appears to predict community integration. However, researchers have consistently found that single, male, racial minority members with less education were at risk of having experienced a violence-related injury, and at times the predictive value of etiology of injury was diminished or abolished once these demographic variables were included. Differences found between racial groups and outcome following TBI will be discussed in more detail later.

**TBI Research Comparing Racial Groups**

There is limited research specifically comparing racial groups among TBI survivors. Before discussing this research, it is important to review the definitions of race, ethnicity, and ethnic identity, as well as problems related to these definitions. The terms race and ethnicity are often used interchangeably; however, although definitions vary, race and ethnicity refer to different constructs. Specifically, although there is no agreed upon definition of race, race tends to be based more on phenotype (Hays, 2001). In the *Guidelines on multicultural education, training, research, practice, and organization change for psychologists*, the American Psychological Association (APA; 2002) presented the definition of race as “the category to which others assign individuals on the basis of physical characteristics, such as skin color or hair type, and the generalizations and stereotypes made as a result” (p. 9). Similarly, the definition of ethnicity is not agreed upon; however, ethnicity generally refers to identification with the values, beliefs, and customs of one’s culture and may include a sense of belonging to one’s ethnic group as well (APA, 2002; Hays, 2001). Similarly, ethnic identity specifically refers to the degree to which one identifies with his or her ethnic group (Phinney, 1992). Ethnic identity will be discussed in more detail later.
Access to health care and treatment variables. Access to healthcare and treatment differs depending on various socioeconomic variables including race, and research specific to TBI healthcare services and treatment is no exception. For example, disparities have been found for race (Bazarian, Pope, McClung, Cheng, & Flesher, 2003; Burnett et al., 2003; Selassie, Pickelsimer, Frazier, & Ferguson, 2004; Shafi et al., 2007), insurance status (Selassie et al., 2004), and gender (Selassie et al., 2004).

Selassie et al. (2004) conducted a study investigating the relationship between insurance status and several demographic variables with admission to ED’s. Specifically, the authors were interested in likelihood of being admitted to the hospital from the ED as a function of various factors including age, race and gender, insurance status, TBI severity, number of body regions injured, number of preexisting conditions, place of residence (urban, rural, out-of-state), year of discharge, and trauma center level. Notably, due to a small percentage of racial minorities other than African American (2.6% of the sample), the authors combined all racial minorities together and classified the four groups as African American female, African American male, Caucasian female, and Caucasian male. African Americans (combined with other racial minorities) comprised of 33% of the total sample. The authors reviewed files from the State of South Carolina Hospital Discharge and Emergency Department Visit Data Sets for 70,671 patients. The authors found that severity of TBI and number of preexisting conditions were the strongest predictors of being hospitalized. However, the uninsured were less likely to be hospitalized even after adjusting for demographic, clinical, and hospital characteristics. In terms of race and gender, after adjusting for all other covariates, African American women were less likely to be hospitalized compared to Caucasian women. Men were more likely to be hospitalized than women, regardless of race. The authors also noted that African Americans accounted for 33% of
the total sample, but 41% of the uninsured were African American. The authors concluded it is not clear whether services were over or under provided in terms of hospital admission, but there are disparities in treatment in terms of race, gender, and insurance status.

Similarly, Shafi et al. (2007) conducted a study investigating race differences in access to rehabilitation services following TBI. Using a national database (National Trauma Data Bank) the authors compared 58,729 TBI survivors including Caucasians (n = 45,061), African Americans (n = 8,325), and Hispanics (n = 5,406). Race was an independent predictor of being placed in rehabilitation following hospitalization. Racial minorities’ odds of being placed in rehabilitation were 15% lower than for Caucasians, although having insurance generally improved these odds. Comparing each African Americans and Hispanics to Caucasians separately showed both groups had lower odds of being placed compared to Caucasians; however, after adjusting for demographic and injury characteristics (i.e., age, gender, injury severity, associated injuries, and insurance status), African Americans were no longer significantly different than Caucasians, although Hispanics continued to have lower odds of being placed. The authors concluded that minorities were less likely to be discharged from trauma center hospitals to rehabilitation programs than were Caucasians. However, the authors did not clearly define variables race, ethnicity, and minority, and tended to use all three interchangeably. Also, it was unclear if both African Americans and Hispanics, or just African Americans were included in the analysis reflecting results that racial minorities’ odds of being placed in rehabilitation were 15% lower than Caucasians.

Differences by race have been found in regard to treatment variables as well. Bazarian et al. (2003) conducted a study investigating disparities in ED’s with respect to gender and race among TBI survivors. The authors found that, after controlling for other variables (i.e.,
associated injuries, geographic region, socioeconomic status inferred by insurance status),
African Americans with mild TBI were more likely to receive care from a resident physician and
less likely to be returned to the referring physician for follow-up. However, race did not predict
three ED care variables, including receiving analgesics for pain, having CT scans, and admission
to the hospital. No gender differences were found. The authors concluded that disparities related
to race were present in emergency health care services, even after controlling for other important
variables.

Burnett et al. (2003) further investigated various demographic variables with respect to
injury characteristics as well as treatment and outcome variables. Using data from a national
database (TBIMS) consisting of 2,020 TBI patients who completed acute inpatient rehabilitation
programs, the authors found differences between racial minorities and Caucasians with respect to
demographic variables including age at injury, education level, marital status, gender, pre-injury
employment status, and hours per week of pre-injury paid employment. Differences in injury
characteristics included lower GCS for racial minorities. Racial minorities also were more likely
to have sustained injuries from violent means than were Caucasians, although both minorities
and Caucasians were most likely to sustain injury in MVCs. With respect to treatment variables,
racial minorities received shorter and less intense treatment in physical therapy, occupational
therapy, and speech therapy when compared to Caucasians. Racial minorities also had shorter
stays in rehabilitation. However, with respect to outcome variables, racial minorities only had
lower FIM efficiency scores (derived by dividing the FIM change score by length of hospital
stay). The total FIM score and FIM change score from admission to discharge did not differ
between groups. The authors concluded that racial disparities existed for health care services.
However, despite this, racial minorities did not differ on most outcome variables. The authors
suggest that future research should examine socioeconomic and cultural variables that might explain outcomes.

In summary, consistent with research on racial disparities found for healthcare services generally, access and treatment varies following TBI for different racial groups, even when controlling for common confounding variables (Bazarian et al., 2003; Burnett et al., 2003; Selassie et al., 2004; Shafi et al., 2007). Furthermore, various factors associated with racial minorities, including being more likely to be uninsured, are also related to disparities in healthcare access and treatment following TBI (Selassie et al., 2004; Shafi et al., 2007).

Although Burnett et al. (2003) did not find many differences between racial groups with respect to outcome, others have found such differences among racial groups (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Arango-Lasprilla et al., 2008a; Arango-Lasprilla et al., 2008b; Arango-Lasprilla et al., 2009; Haider et al., 2007; Hart et al., 2005; Rosenthal et al., 1996; Sherer et al., 2003). The next section will review additional research investigating outcomes following TBI for different racial groups.

**Race and outcome.** Given the disparities in treatment and access to healthcare services found for minority racial groups, it is important to examine outcomes as well. Although limited, there is some research comparing racial groups with respect to functional and cognitive outcomes (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Arango-Lasprilla et al., 2009; Burnett et al. 2003; Haider et al., 2007; Rosenthal et al., 1996), quality of life and life satisfaction (Arango-Lasprilla et al., 2009; Hart et al., 2005; Webb, Wrigley, Yoels, & Fine, 1995), productivity (Arango-Lasprilla et al., 2008a; Arango-Lasprilla et al., 2008b; Hart et al., 2005; Johnstone et al., 2003; Rosenthal et al., 1996; Sherer et al., 2003), and community integration (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Hart et al., 2005;
Rosenthal et al., 1996) for TBI survivors. Generally, racial minorities tend to have poorer outcomes than do Caucasians, even when other important demographic variables are controlled.

**Functional and cognitive.** Findings from research comparing racial groups on functional and cognitive outcomes have varied. Some researchers have found differences between racial groups at admission to and discharge from rehabilitation (Arango-Lasprilla et al., 2009; Haider et al., 2007) whereas other researchers have found that differences are most likely to emerge at discharge and one-year follow-up from rehabilitation, with racial minorities faring worse than Caucasians (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b). Some do not find differences (Burnett et al. 2003; Rosenthal et al., 1996).

Arango-Lasprilla et al. (2007a) conducted a study examining differences between Hispanics and Caucasians at admission, discharge, and 1-year follow-up from rehabilitation. Data was obtained from the TBIMS consisting of 3,056 patients (2,745 Caucasians and 311 Hispanics). Several demographic, injury, and rehabilitative measures were administered as part of inclusion to the database. The authors found that Hispanics tended to be male, younger, less educated, and earn less money at the time of injury when compared to Caucasians. There were no differences in DRS or FIM scores at admission to and discharge from rehabilitation. However, multivariable proportional odds logistic regression modeling found that Hispanics were more likely to have poorer outcomes at one-year follow up, as measured by DRS, FIM, CIQ, and Glasgow Outcome Scale-Extended (GOS-E; Wilson, Pettigrew, & Teasdale, 1998) scores, even when controlling for other injury variables. The authors concluded that poorer outcomes for Hispanics at one-year follow-up was likely due to factors occurring after discharge, since no differences were found at discharge. They stressed the importance of investigating post-
rehabilitation factors for racial minorities in order to better understand these long term differences.

In a similar study, Arango-Lasprilla et al. (2007b) compared racial minorities and Caucasians on various outcome measures following TBI. Participants were 4,929 patients (3,354 Caucasians, 1,207 African Americans, and 368 Hispanics) from the TBIMS database. Analyzed were injury severity (GCS, duration of PTA), functional status at admission to rehabilitation, discharge, and 1-year follow-up (DRS, FIM, GOS-E), and community integration at 1-year follow-up (CIQ). Several demographic variables also were analyzed. Race was dichotomized (minorities and Caucasians). The authors found differences between minorities and Caucasians for pre-injury characteristics such that minorities were younger and more likely to be male, unemployed, less educated, married, and to earn less money. Compared to Caucasians, minorities had poorer DRS and FIM scores at discharge from rehabilitation and at 1-year follow-up, and lower CIQ and GOS-E scores at 1-year follow-up. Multiple logistic regression models controlling for other demographic variables and injury and rehabilitation characteristics found that minorities had greater odds of poor outcome at 1-year follow-up.

Haider et al. (2007) conducted a study investigating functional and clinical outcomes following TBI among children from different racial backgrounds. The authors extracted data from a national database (National Pediatric Trauma Registry) consisting of 7,778 children with moderate to severe TBI. After controlling for injury characteristics and other demographic variables, the authors used multiple logistic regression to compare race on outcome. They found African American children had greater functional deficits in the three domains studied (speech, locomotion, and feeding) at discharge from hospital, and they were more likely to be discharged to an inpatient rehabilitation facility, compared to Caucasian children.
As part of a larger study investigating differences between racial groups for life satisfaction one-year post injury, Arango-Lasprilla et al. (2009) found differences between racial groups on DRS and FIM scores at admission to and discharge from rehabilitation. Data for 3,368 TBI survivors was obtained from the TBIMS and is described in more detail later. In terms of DRS and FIM scores, the authors found that Asian/Pacific Islanders had higher FIM scores than African Americans on admission. African Americans had lower DRS and FIM scores at discharge compared to Caucasians, Asian/Pacific Islanders, and Hispanics.

Consistent with Burnett et al. (2003), others have not found differences between racial groups with respect to functional outcome. As part of a larger study, Rosenthal et al. (1996) predicted that racial minorities would not differ on acute rehabilitation outcomes (e.g., functional impairment/disability) after controlling for other injury variables (e.g., injury severity). Their sample consisted of 586 patients admitted to National Institute for Disability and Rehabilitation Research (NIDRR) Model Systems facilities from 1989-1995, with 301 at one-year follow-up. Race was dichotomized as Caucasian (about 53%) or racial minority (about 47%). Consistent with their hypotheses, no differences between racial groups on the FIM and DRS scores were found at admission, discharge, or 1-year follow-up. Also as part of a larger study, Gary et al. (2010) did not find differences between racial groups for FIM scores at discharge or DRS scores at admission or discharge; however, they did find that racial minorities had higher FIM scores on admission.

In conclusion, research is inconclusive regarding the presence of functional and cognitive outcome differences following TBI even when controlling for other injury variables. When differences are found, they emerge most frequently at longer time periods post injury (e.g., at discharge or one-year follow-up).
Quality of life and life satisfaction. Quality of life and life satisfaction following TBI is another outcome that has been investigated among racial groups. Arango-Lasprilla et al., (2009) noted that quality of life and life satisfaction have been used interchangeably in the TBI literature. However, quality of life may best be viewed as an overarching construct that includes a variety of factors such as health, emotional, physical, mental, and social well-being (Gill & Feinstein, 1994). In contrast, Diener, Emmons, Larsen, and Griffin (1985) conceptualized life satisfaction as the subjective judgment of one’s quality of life, usually utilizing self-imposed standards in self evaluation of one’s current state.

Challenges arise due to the subjective nature of measuring a construct such as life satisfaction, and researchers have attempted to measure it in various ways in the TBI literature, usually employing self-report measures. One of the most common, although certainly not the only measure, is the Satisfaction with Life Scale (SWLS; Diener et al., 1985). The SWLS is a 5-item measure of life satisfaction in which participants are asked to rate how strongly they agree with five statements on a 1 to 7 scale (1 = strongly disagree and 7 = strongly agree). Scores on the SWLS range from 5 to 35, with higher scores indicating greater levels of life satisfaction (Diener et al.). The SWLS has demonstrated adequate reliability, with a test-retest correlation coefficient of 0.82 and alpha coefficient of 0.87 (Diener et al., 1985). In terms of validity, Pavot and Diener (1993) reported that a variety of studies have investigated convergent validity for the SWLS with variable results, but with primarily modest correlations ranging from 0.28 to 0.82. In this respect, although the brevity of the scale is appealing in terms of convenience, it should be noted that psychometrically shorter scales are more subject to measurement error.

Research investigating racial differences in satisfaction with life has been sparse and the results are inconsistent. Webb et al. (1995) found a relationship between race and life
satisfaction. The authors conducted a study investigating the predictive value of demographic, psychosocial, physical, and rehabilitative factors on quality of life two years post injury among TBI survivors. A sample of 116 TBI survivors was included as part of a larger study (University of Alabama at Birmingham’s Injury Control Research Center; UAB-ICRC). Data included in this database were retrieved retrospectively via medical chart review. The authors created a measurement of quality of life using the Life Satisfaction Index (LSI-A), deriving a change score by assessing LSI at 12 and 24 months post injury and assigning codes indicating if quality of life increased, decreased, or stayed the same. Using path analysis, employment had the strongest relationship with quality of life. In terms of race, there was only a direct relationship between race and quality of life with African Americans reporting greater quality of life than did Caucasians.

Similarly, Arango-Lasprilla et al. (2009) investigated differences in life satisfaction for TBI survivors one-year post injury for 2,478 Caucasians, 629 African Americans, 180 Hispanics, and 81 Asians. Data on participants was acquired from the TBIMS. An Analysis of Variance (ANOVA), without considering confounding variables, showed African Americans had lower life satisfaction scores than all other racial groups, although all other racial groups did not differ from each other. However, after adjusting for significant demographic (pre-injury marital and employment status) and injury predictors (FIM score at discharge, length of time in hospital, etiology of injury) using an Analysis of Covariance (ANCOVA), African Americans had less life satisfaction compared only to Asians and Caucasians. The authors concluded that race differences for life satisfaction are present one-year post injury even when other variables are considered.
In contrast, Hart et al. (2005) found no significant between group differences using ANCOVA for life satisfaction using the SWLS for African Americans and Caucasians at retrospective pre-injury and post-injury, though African Americans report lower scores at both time periods. Change in life satisfaction between pre-injury and post-injury within each racial group did show a significant decline in life satisfaction for each racial group.

**Productivity.** Psychosocial and psychological problems along with cognitive and physical impairments resulting from TBI can limit an individual’s ability to return to work. Thus, participation in employment or other meaningful sources of productivity are often included in TBI outcome research. Measurement of productivity has varied amongst researchers with some including competitive employment, student status, and homemaker as productive (Sherer et al., 2003), whereas others only include competitive employment as productive (Arango-Lasprilla et al., 2008a; Arango-Lasprilla et al., 2008b). Others have used portions of measures, such as the CIQ, to measure productivity (Hart et al., 2005; Rosenthal et al., 1996).

Researchers have found poorer outcome for racial minorities relative to Caucasians using the Productivity subscale of the CIQ (Rosenthal et al., 1996). This subscale assesses for productivity in employment, school, and volunteer involvement. Using an ANOVA, Rosenthal and colleagues found in a sample of 586 TBI survivors (46.6% racial minorities) that racial minorities had lower scores on the Productivity subscale compared to Caucasians one-year post injury. Contrary to these findings, Hart et al. (2005) found no differences between African Americans and Caucasians for retrospective pre-injury and post-injury Productivity subscale scores on paired t-tests. These studies will be considered in greater detail below.

Sherer et al. (2003) investigated productive outcomes at one-year follow-up for racial minorities compared to Caucasians for 1,083 participants, using the TBIMS database. The
authors hypothesized that variables confounded with race would influence productivity outcomes, especially pre-injury demographic variables and injury characteristics. Predictor variables included race, age at injury, pre-injury education level, sex, marital status, cause of injury, pre-injury productivity status, GCS at admission, PTA, length of stay in hospital, and FIM and DRS scores at discharge. The outcome of productivity included competitively employed at least part-time, at least part-time student, or full-time homemaker. All other productivity statuses were classified as not productive. Race was classified as Caucasian, African American, or other. A logistic regression analysis showed that African Americans were nearly three times more likely not to be productive compared to Caucasians, while other racial minorities were nearly twice as likely not to be productive. After adjusting for other predictors, African Americans and other racial minorities were twice as likely not to be productive at one-year follow-up compared to Caucasians. The authors concluded that race is predictive of productivity outcomes even when confounding variables are controlled; however, these other variables also are predictive of productivity outcome, especially pre-injury productivity, education, and cause of injury. Specifically, individuals of a racial minority group with low pre-injury productivity, low education levels, and violent causes of injury are at a greater risk of not being engaged in productive roles one year following injury.

Arango-Lasprilla et al. (2008b) investigated employment status for racial minorities compared to Caucasians one-year post injury in a sample of 5,259 cases acquired from the TBIMS database (Caucasians = 3,468, racial minorities (African Americans = 1238, Hispanics = 384, Asians = 142, and Native Americans = 27) = 1,791). Employment status was classified as competitively employed if work was for payment, and unemployed was used for all other work (e.g., student). The authors also classified those who were competitively employed into three
categories referred to as occupation status: professional/managerial (e.g., executives, administrative), skilled (e.g., sales, administrative support), and manual labor (e.g., machine operators, transportation). Covariates included sex, marital status, education level, cause of injury, DRS at discharge, GCS at admission, PTA, age, and pre-injury employment and occupation status. Logistic regression models were used to predict employment and occupation outcome. Results of the adjusted model, with significant covariates accounted for, showed racial minorities were 2.17 times more likely to be unemployed than Caucasians at one-year follow-up. For occupational status, unadjusted logistic regression showed racial minorities were more likely to obtain manual labor and skilled rather than professional/managerial positions compared to Caucasians; however, racial differences were no longer significant after controlling for covariates. The authors concluded that racial minorities are at risk for poorer employment outcome one-year post injury compared to Caucasians, even when relevant demographic and injury characteristics are taken into account.

As part of another study investigating marital stability at two years post injury, Arango-Lasprilla et al. (2008a) also found differences in employment status between racial groups. Participant data was acquired from the TBIMS and included 226 racial minorities and 751 Caucasians. Competitive employment was classified as employed for payment, with being a student or doing volunteer work classified as unemployed. Using t-tests and chi-square analyses, racial minorities were less likely to be competitively employed than Caucasians. In addition, racial minorities were more likely to be male, have a violent cause of injury, have lower incomes, and less likely to have a high school education. Employment status was not an outcome measure for this study therefore analyses comparing racial groups while accounting for other variables was not considered.
Using a national archival database Gary et al. (2010) investigated racial differences in employment outcomes 10 years post injury. Participants were classified as employed if they were receiving payment for part-time or full-time work. Thus student status, volunteer work, and homemakers were classified as unemployed. Using a logistic regression model, researchers found factors associated with greater likelihood of being employed 10 years after injury included being employed at the time of injury, non-violent injury etiology, younger age, and short length of stay in the hospital. After controlling for these variables, Caucasians were still 2.37 times more likely to be employed than were racial minorities. The authors concluded that racial minorities have poorer employment outcome at 10 years post injury compared to Caucasians, consistent with research showing poorer outcomes at shorter post-injury time periods. They argued that it is particularly notable that these discrepancies persisted even after controlling for other demographic and injury characteristics.

Although many researchers’ findings support the notion that racial minorities fare worse than Caucasians in terms of productivity following TBI, some researchers have not found differences. Johnstone et al. (2003) conducted a study of TBI survivors in which differences between racial groups in obtaining employment following completion of a vocational rehabilitation program were analyzed. Participants included 75 TBI survivors (13 African Americans and 62 Caucasians) receiving Missouri Division of Vocational Rehabilitation services. Individuals who successfully completed the vocational rehabilitation program were classified as successfully closed, which meant individuals that received vocational services successfully obtained employment at the time of case closure. The authors used non-parametric multiple analysis of variance (MANOVA) statistics to compare racial groups on demographic and injury characteristics as well as vocational outcomes. No differences between African
Americans and Caucasians were found for vocational outcome, such that 23% of African Americans and 18% of Caucasians were classified as successfully closed. Interestingly, the authors also found few differences between racial groups for demographic variables that previous researchers have found to be significantly different, such as level of education. The authors concluded that there were few differences in vocational outcome between African Americans and Caucasians following TBI when vocational rehabilitation services are received. However, the authors had a small sample size relative to other studies, and it is possible that a sample of 13 African American was not representative or large enough to have enough power to find an effect. Another possibility is that screening for enrollment in Vocational Rehabilitation services produced a homogeneous sample population, regardless of race.

Overall, differences in being employed post injury have been found between racial groups. These findings persist whether or not there are different definitions of productivity and different inclusion/exclusion criteria for productive activities (e.g., student). Further, these differences often persist when other potentially confounding demographic and injury variables are accounted for in analyses. There is some evidence that if vocational rehabilitation services are received, differences between racial groups may no longer be significant; however, more research on this is needed.

**Community integration.** As discussed earlier, community integration is an important measure of outcome for TBI survivors, as it examines how successful individuals are participating in their communities following injury. Researchers have investigated differences between racial groups for the CIQ total score as well as scores from the subscales (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Hart et al., 2005; Rosenthal et al., 1996);
however, unfortunately, few have attempted to establish community integration between racial
groups premorbidly (Hart et al., 2005).

Rosenthal et al. (1996) conducted a study investigating the effect of race on community
integration among TBI survivors one-year post injury. Database records for 586 individuals with
TBI extracted from a national database (NIDRR Model Systems). Outcome measures included
FIM and DRS scores at admission, discharge and one-year follow-up, and CIQ at one-year
follow-up. Data on demographic and injury characteristics included severity of injury (GCS and
PTA), gender, age at injury, education level, social support (marital status and if living with
someone), etiology of injury, substance abuse, annual family income, occurrence of
posttraumatic seizures, and RLA classification at admission and discharge. Race was classified
as Caucasian or racial minority (including African Americans, Hispanics, and Asian/Pacific
Islanders). Group comparison analyses were conducted using ANOVA and chi-square statistics.
A multiple regression analysis was conducted to examine the effect of race and other variables
on outcome. With respect to community integration, the authors found that minorities had lower
scores on the CIQ than did Caucasians ($F = 24.91$). Upon examination of CIQ subscales, it was
found that minorities had lower scores on the Social Integration ($F = 28.54$) and Productivity ($F$
$= 14.41$) subscales but not on the Home Integration subscale ($F = 3.88$). Etiology of injury, age,
family income, and substance abuse also predicted CIQ scores such that violent cause of injury,
older age, lower family income, and greater substance abuse were associated with lower CIQ
scores. The authors concluded that, despite similarities on FIM and DRS scores between racial
groups, there were disparities between racial groups at one-year for community integration, with
minorities faring worse. They noted that racial minorities had lower community integration even
when other socioeconomic variables predictive of community integration were included in the
analysis. Although differences in community integration were found post injury, it is not clear if changes in community integration from pre to post injury also differed, because pre-injury community integration was not assessed.

Described in detail above, Arango-Lasprilla et al. (2007a; 2007b) conducted studies investigating differences between racial minorities and Caucasians for various outcome variables at admission, discharge, and one-year follow-up from rehabilitation. In both studies, CIQ scores were compared at one-year follow-up using multivariable logistic regression modeling. In both studies, racial minorities were found to have greater likelihood of poorer community integration compared to Caucasians, even when other demographic and injury variables were taken into account. In both cases, the authors concluded that racial minorities were more likely to have poorer community integration outcomes one-year post injury and thus further investigation of post-rehabilitation factors is important for understanding these differences.

Most researchers investigating community integration differences between racial groups post injury did not assess pre-injury levels. One study that did is that of Hart et al. (2005), which investigated several outcome variables including community integration for African American and Caucasian survivors of TBI, retrospectively for premorbid levels and at one-year post injury. Participants included 94 survivors of TBI (55 Caucasian, 39 African American) recruited from TBI rehabilitation programs. The CIQ, SWLS, and Neurobehavioral Functioning Inventory-Revised were administered, and questions about employment status and income were administered at 6 months or less post injury to obtain retrospective data, and then re-administered one year post injury. Data on demographic variables also was collected, including age, gender, education level, marital status, and who the participant was living with pre and post injury. Injury characteristics included etiology, GCS, time to follow commands, PTA (using the
Galveston Orientation and Amnesia Test (GOAT), and DRS score. Interestingly, when the authors compared the two racial groups on demographic variables, they noted that African Americans tended to be younger, less educated, have less income, and were more likely to be single, consistent with past research; however, the only demographic variable that was statistically significant was gender (more men in the African American group).

In this study, Hart et al. (2005) analyzed the three subscales of the CIQ separately, using t-tests to compare pre-injury status and ANCOVAs at one-year follow-up using pre-injury scores as covariates. The authors also compared change from pre to post injury using paired sample t-tests within each racial group. They found that retrospective functioning as measured by the CIQ was equal between racial groups for all three subscales. Home Integration was equivalent between groups at one-year follow-up, with neither racial group showing significant change from pre to post injury. Neither were there differences on the Productivity subscale at one-year follow-up; however, both racial groups showed a significant change from pre to post injury, with declines in productivity at follow-up (Caucasians: $t = 5.5$; African Americans: $t = 5.5$). On the Social Integration scale, African Americans reported poorer integration at follow-up compared to Caucasians ($F = 10.7$). Further, African Americans demonstrated a significant change across time in social integration ($t = 2.9$), whereas Caucasians did not. The authors concluded that, although racial groups were similar with respects to home integration, there were differences between racial groups from pre injury. While these differences were not explained by the current study, there was question as to whether or not a decline in social integration actually reflected poor outcome for African Americans. Specifically, the authors reported that some African American participants reported social isolation, but others commented that not spending time with their friends was positive, as their social group “had been a bad influence on them” (Hart et
Contrary to previous research, African Americans and Caucasians were similar with respect to post-injury scores on the Productivity subscale. The authors argued this may be due to similar premorbid levels of employment, which research has found to be a strong predictor of post-injury employment. Further, the similarity in employment status between racial groups, as well as on other demographic variables (e.g., education level) was contrary to previous research. Overall, the authors concluded that differences between racial groups emerge on the CIQ from premorbid levels to one-year follow-up; however, future research is needed to explain these differences.

In conclusion, similar to research on other outcome variables, racial minorities tend to have poorer outcome for community integration following TBI. However, when examined more closely, racial minorities fare worse than Caucasians mostly in terms of social and productivity integration. Although limited information about premorbid community integration is available, it appears that community integration is similar pre injury between races, with social integration declining more significantly for racial minorities after TBI.

**Ethnic Identity**

There is research supporting the presence of differences between racial groups for treatment and outcome of TBI (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Arango-Lasprilla et al., 2008a; Arango-Lasprilla et al., 2008b; Arango-Lasprilla et al., 2009; Bazarian et al., 2003; Burnett et al., 2003; Haider et al., 2007; Hart et al., 2005; Rosenthal et al., 1996; Selassie et al., 2004; Shafi et al., 2007; Sherer et al., 2003). However, no research has been published that has investigated variables that could explain the differences found between racial groups following TBI. As reviewed, researchers have controlled for confounding demographic and injury characteristics such as age, gender, education level, socioeconomic status (i.e., family
income or insurance status), pre-injury employment status, etiology of injury, severity of injury, and levels of disability or cognitive and physical functioning. Yet racial differences in outcome have persisted despite controlling for these variables. Researchers have repeatedly concluded that we need to conduct research investigating why these differences may emerge, such as beliefs about healthcare, perceived and/or experienced racism, and acculturation variables. For example, Hart et al. (2005) suggested examining differences in cultural norms or financial opportunities. One such variable that may explain racial differences in outcome is ethnic identity. Ethnic identity has been defined as “that part of an individual’s self-concept that derives from his or her knowledge of membership in a social group (or groups) together with the value and emotional significance attached to that membership” (Phinney, 1992, p. 156). A commonly used measure of ethnic identity is the Multi-group Ethnic Identity Measure (MEIM; Phinney, 1992), which is designed to measure qualities of ethnic identity that are not specific to any one group. Thus, the measure can be used across different ethnic groups.

**Ethnic identity, quality of life/life satisfaction, and self-esteem.** Although the relationship of ethnic identity and outcome for survivors of TBI has not yet been investigated, researchers have studied the relationship between ethnic identity and other positive outcomes such as self-esteem and quality of life. For example, Lopez (2008) conducted a study examining the relationships among ethnic identity, skin color, and self-esteem among 53 mainland Puerto Rican women. To measure skin color, both participants and the investigator rated skin color on a 9-point scale, followed by a spectrophotometer rating (which provides a score for light intensity and a score for yellow melanin). Participants also completed the Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1989), MEIM, and Bidimensional Acculturation Rating Scale (Marín & Gamba, 1996) and completed demographic information. After controlling for Spanish
proficiency and frequency of visits to Puerto Rico, they authors found a significant interaction between ethnic identity and skin color for explaining self-esteem. Although self-esteem was high across the sample, the results showed that women with high levels of ethnic identity and light skin had the best self-esteem, followed by women with high levels of ethnic identity and darker skin. Women with low levels of ethnic identity had the lowest levels of self-esteem. In sum, ethnic identity was related to self-esteem among Puerto Rican women, such that greater ethnic identity predicted greater self-esteem.

In another study investigating self-esteem, Cavazos-Rehg and DeLucia-Waack (2009) examined ethnic identity, acculturation, and self-esteem for 150 Latino adolescents from schools in Buffalo, New York, Boston, Massachusetts, and Houston, Texas enrolled in either a bilingual (n = 99) or traditional educational program in the U.S. (n = 51). First, they investigated group differences in self-esteem using the RSE, ethnic identity using the revised version of the MEIM (Roberts et al., 1999), and acculturation using the Short Acculturation Scale for Hispanics-Youth (SASH-Y; Barona & Miller, 1994). In addition to a total score, the revised MEIM has two subscales—the Affirmation, Belonging, and Commitment subscale and the Ethnic Identity Search subscale. The SASH-Y has three subscales—Language Use, Media, and Ethnic Social Relations. Second, researchers examined predictors of self-esteem for each group combined and separately. Finally, they explored whether or not acculturation mediated the relationship between ethnic identity and self-esteem. No differences were found for self-esteem or ethnic identity between groups; however, the traditional education group had higher scores of acculturation. The authors found grade point average (GPA), the Affirmation, Belonging, and Commitment subscale of the MEIM, and the Ethnic Social Relations subscale of the SASH-Y significantly predicted self-esteem for both groups combined. In separate group analyses, the same predictors
were supported for the bilingual education group, but only GPA and the total SASH-Y score predicted self-esteem for adolescents in the traditional education group. Although ethnic identity predicted self-esteem, acculturation was not found to mediate this relationship. The authors concluded that ethnic identity was a predictor of self-esteem for adolescents in the bilingual program, but not the traditional program, hypothesizing that this may be due to differences in environment. Specifically, they noted that it likely was possible that students in the bilingual program had more access to in-group opportunities than did students in the traditional education program.

In terms of quality of life, Utsey, Chae, Brown, and Kelly (2002) hypothesized that ethnic identity and race-related stress would be predictive of overall quality of life. They administered the MEIM, the Index of Race-Related Stress-Brief Version (IRRS-B; Utsey, 1999), and the World Health Organization Quality of Life-Brief Version (WHOQOL-Brief; WHO, 1998) to 160 African American, Asian American, and Latino participants obtained from various community settings in the northeastern United States. Ethnic identity and race-related stress significantly predicted overall quality of life, such that greater race-related stress predicted lower quality of life and greater ethnic identity predicted higher quality of life. The authors concluded that ethnic identity may be a protective factor for racial minorities.

In another study, Yap et al. (2011) investigated the relationship between racial identity and life satisfaction for 161 African American men and women. Racial identity was conceptualized as being composed of three constructs: racial centrality, racial public regard, and racial private regard. Racial centrality referred to the importance of race to one’s self-concept. Racial private regard referred to how individuals perceived their own racial group. Racial public regard referred to how individuals perceived others’ perceptions of their racial group. The
authors hypothesized that racial identity functions (i.e., perceived belongingness and discrimination) would mediate relationships between racial identity and life satisfaction. The authors found that perceived belongingness mediated the relationship between racial centrality and life satisfaction as well as private regard and life satisfaction. However, when the authors accounted for gender, they found these results for women only. They also found that perceived discrimination mediated the relationship between public regard and life satisfaction; however, gender was not a significant moderator. In fact, discrimination no longer emerged as a significant mediator of public regard and satisfaction with life when belongingness was entered into the model. The authors concluded that there is a relationship between racial identity and well-being, and this relationship may be altered by racial identity variables (i.e., belongingness and discrimination) and gender.

Overall, research on influence of ethnic identity has shown that feelings of group membership and belongingness are associated with positive outcomes for ethnic and racial minorities. That is, ethnic identity is consistently and positively related to self-esteem (Cavazos-Rehg & DeLucia-Waack, 2009; López, 2008) and quality of life or life satisfaction (Utsey et al., 2002; Yap et al., 2011).

Conclusion and Hypotheses

In sum, there is some evidence that racial background is predictive of outcome following TBI, specifically with regards to community integration. However, no research exists that has explained why racial differences might be present with respect to community integration following TBI. Ethnic identity may be one such variable. Given that higher levels of ethnic identity have been found to be predictive of greater quality of life and self-esteem among racial minorities, it also may be associated with more positive outcomes following TBI. Thus,
accounting for important demographic and injury characteristics, the current study investigated the predictive power of ethnic identity on community integration for TBI survivors of various racial backgrounds. The following were hypothesized:

1. Covariates identified as significant in preliminary analysis (e.g., severity of injury, pre-injury employment status) will be predictive of community integration following TBI.
2. Race will be predictive of community integration following TBI such that minority racial status will predict poorer community integration.
3. After controlling for other variables, greater ethnic identity will be predictive of better community integration following TBI.

**Method**

**Participants and Setting**

Participants were included if they met the following criteria: at least 1-year post injury and no history of premorbid neurological disorder (e.g., dementia, epilepsy). A proxy (e.g., caregiver) could assist participation by a TBI survivor, which is common when conducting research using this clinical group (e.g., Heinemann & Whiteneck, 1995; Schmidt et al., 1995; Gerhart et al., 2003). Recruitment was conducted primarily through organizations providing TBI services or support (e.g., support groups, Brain Injury Association of America) as well as through advertisements in rehabilitation and medical facilities (e.g., hospitals), internet, and snowball recruitment. Broad recruitment strategies were desired in order to capture a diverse and representative sample. Many researchers use rehabilitation centers and hospitals or ongoing databases associated with these facilities to acquire data on TBI survivors. However, given the aforementioned disparities in access to rehabilitation care (Selassie et al., 2004; Shafi et al., 2007), a wider approach to sampling was attempted to help capture a more representative
population than previous studies, especially in terms of racial and ethnic minority status. Unfortunately, recruitment of racial and ethnic minorities remained problematic in the current study.

There were 91 initial responses to the online survey, for which 13 cases were excluded due to incomplete informed consent and five who withdrew before beginning the survey. Incomplete consent included two participants who endorsed being under age 18, three who endorsed having legal guardians, three who endorsed not having all questions answered, one who endorsed not reading and understanding the description of participant duties, six endorsed not being offered a copy of the consent, and two participants endorsed having a proxy who did not understand that the participant wished to participate. All participants, including those with incomplete informed consent, endorsed wishing to participate and understanding that they could withdraw without consequence. Additionally, all participants endorsed giving consent. See Table 1 for frequency of responses to informed consent. An additional eight participants withdrew participation following completion of the demographic questionnaire (six Caucasian and two racial minorities), but before completing the primary criterion measure (i.e., CIQ). Seven participants were excluded due to sustaining brain injury other than by trauma (e.g., stroke). Of the remaining 58 participants, 50% were female (n = 29), 82.8% were Caucasian (n = 48) and 17.2% endorsed being a racial minority (n = 10). There were six participants who identified as multi-racial. Among racial minorities, racial categories represented included 10.3% Native American/Native Alaskan (n = 6), 8.6% Latino (n = 5), and 1.7% Native Hawaiian/Pacific Islander (n = 1). There were no Asian or African American participants. Due to the small sample sizes within racial minority categories, race was collapsed into two variables: Caucasian and racial minorities.
Table 1

<table>
<thead>
<tr>
<th>Informed Consent Item</th>
<th>No</th>
<th>Yes or N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am 18 years of age or over.</td>
<td>2</td>
<td>89</td>
</tr>
<tr>
<td>I understand that, if I have a legal guardian appointed I should not participate in this study, because verification of approval from a legal guardian cannot be obtained.</td>
<td>3</td>
<td>88</td>
</tr>
<tr>
<td>All my questions have been answered.</td>
<td>3</td>
<td>88</td>
</tr>
<tr>
<td>I have read and understand the description of my participation duties.</td>
<td>1</td>
<td>90</td>
</tr>
<tr>
<td>I have been offered a copy of this form to keep for my records.</td>
<td>6</td>
<td>85</td>
</tr>
<tr>
<td>I agree to participate in this study and understand that I may withdraw at any time without consequence.</td>
<td>0</td>
<td>91</td>
</tr>
<tr>
<td>If due to my functional limitations I am having someone help me complete this survey, he/she understands that it is my wish to participate in this survey and that I can discontinue at any time.</td>
<td>2</td>
<td>89</td>
</tr>
<tr>
<td>I give my consent to participate in the current study.</td>
<td>0</td>
<td>91</td>
</tr>
</tbody>
</table>

Research Design and Procedure

A correlational design was used to investigate the relationship of several predictor variables with community integration as measured by the CIQ. Following provision of informed consent, participants were asked to answer an online questionnaire consisting of the measures described below.

Measures

**Demographic variables.** Demographic information, including age at time of injury, years since injury, sex, race, educational achievement pre-injury and currently, employment status pre-injury and currently, and annual household income pre-injury and currently, was collected. In terms of race, participants were asked to indicate all that apply including Native American/Native Alaskan, Asian, African American, Latino, Native Hawaiian/Pacific Islander, Caucasian, and Other. Additionally, participants were asked to indicate whether or not another person assisted them in completing the questionnaire.
Injury characteristics. Information about injury was gathered, including time since injury, etiology of injury (i.e., motor vehicle collision, violence-related, falls, and other), and severity of injury. Severity of injury was measured in two ways. First, participants were asked to identify duration of unconsciousness (i.e., < 30 minutes, < 1 hour, < 1 day, < 1 week, < 1 month, and > 1 month). Second, responses from the Mayo-Portland Adaptability Inventory 4th edition (MPAI-4) Ability Index were used to assess the individual’s physical and cognitive abilities, an indicator of injury severity. Additionally, participants were asked to report medical treatment they received following TBI including emergency room evaluation, follow-up doctor’s appointment, intensive care for any period of time, overnight hospital stay, hospital stay for longer than one night, inpatient rehabilitation therapy while still in hospital, and outpatient rehabilitation therapies.

Community Integration Questionnaire. The Community Integration Questionnaire (CIQ) was developed to assess outcome among individuals with history of TBI. According to Willer et al. (1993), community integration as measured by the CIQ is defined as “integration into a home-like setting, integration into a social network, and integration into productive activities such as employment, school, or volunteer work” (p. 75). Development of the CIQ was based on the converse of handicap as defined by the World Health Organization (WHO; Willer et al., 1993, Rosenthal et al. 1996). The CIQ is a 15-item scale, with a total score possible ranging from 0-29 and higher scores indicating greater community integration. Examples of items are “Who usually does meal preparation?” “Who usually does caring for children?” “How often go you travel outside the home?” Individual items are scored 0, 1, or 2, depending on the level of independence or frequency of participation in various activities. In addition to the total score, three subscale scores of Home Integration, Social Integration, and Productive Activities
can be derived. Home Integration scores range from 0-10, Social Integration scores range from 0-12, and Productive Activities scores range from 0-7.

The CIQ has demonstrated adequate reliability and validity (Willer et al. 1993; Dijkers, 1997; Corrigan & Deming, 1995). Test-retest reliability has been found to range from .91 to .97 (Dijkers, 1997) and internal consistency, as demonstrated by Cronbach’s alpha, ranged from .76 to .90 (Dijkers, 1997). Construct validity was demonstrated by significant correlations for total scores between another measure of community integration, the Craig Handicap Assessment and Reporting Technique (CHART; Whiteneck et al., 1992) and the CIQ (Willer et al., 1993).

Additionally, the CIQ was developed to be appropriate for TBI survivors to reliably assess their own integration. Indeed, the CIQ has shown adequate interrater reliability between TBI survivors’ responses and a close family member, suggesting TBI survivors can provide reliable responses to the CIQ (Willer et al., 1993). Although, others have found varying reliability of responses by TBI survivors compared to a proxy reporter, with a tendency of TBI survivors to endorse greater integration, especially for the Home Integration subscale (Dijkers, 1997).

Although the CIQ has demonstrated adequate reliability and validity within the target population as a whole, the CIQ lacks normative data for racial minorities (Dijkers, 1997). However, in studies comparing racial groups, similar patterns of community integration measured by the CIQ have been found for racial minorities as for Caucasians. For example, many of the previously discussed predictors of community integration (e.g., severity of injury, age, premorbid employment status) are predictive across racial groups (Arango-Lasprilla et al., 2007b; Rosenthal et al., 1996). Also, Hart et al. (2005) found that retrospective ratings of premorbid community integration as measured by the CIQ did not differ between racial groups. There also have been differences found on CIQ scores when taking into account demographic
variables such as age (Rosenthal et al. 1996; Corrigan & Deming, 1995, Willer et al., 1993),
gender (Dijkers, 1997; Corrigan & Deming, 1995) and income (Rosenthal et al., 1996).

**Multigroup Ethnic Identity Measure.** Phinney (1992) defined ethnic identity as “that part of an individual’s self-concept that derives from his or her knowledge of membership in a social group (or groups) together with the value and emotional significance attached to that membership” (p. 156). The Multigroup Ethnic Identity Measure (MEIM) was designed to assess ethnic identity across different ethnic and racial groups based on the premise that there are broad characteristics associated with identification with ethnicity and culture common to individuals of any ethnicity (Phinney, 1992). The MEIM was originally a 22-item questionnaire composed of an Ethnic Identity (EI) subscale (14 items) and a subscale of Other-Group Orientation (OGO; 6 items). Three additional subscales of the EI subscale are Affirmation and Belonging, Ethnic Identity Achievement, and Ethnic Behaviors (Phinney, 1992). Roberts et al. (1999) presented a revised version of the EI subscale composed of 12 items, with two subscales of Affirmation/Belonging and Exploration. Given results of an exploratory factor analysis and the potentially confusing negative wording of two items from the original Ethnic Identity Achievement subscale, these two items were eliminated from the original scale. Therefore, the revised version of the EI subscale reported by Roberts et al (1999) was used in the current study.

Sample items from the MEIM include “I have a clear sense of my ethnic background and what it means for me,” “I am happy that I am a member of the group I belong to,” “I have a strong sense of belonging to my own ethnic group,” and “I like meeting and getting to know people from ethnic groups other than my own.” Respondents rate how much they agree or disagree with the statements on a 1 to 4 Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Scores on the EI scales range from 12 to 48, with higher scores indicating
stronger ethnic identity. Scores on the OGO scale range from 1 to 20, with higher scores indicating stronger orientation to other ethnic groups. Factor analysis has generally supported a two-factor model of the MEIM, with items loading onto the EI and OGO subscales (Phinney, 1992; Ponterotto, Gretchen, Utsey, Stracuszzi, & Saya, 2003).

Across 12 studies, Ponterotto et al. (2003) found that internal consistency, as measured by coefficient alpha, was acceptable for the EI subscale, and ranged from 0.81 to 0.92. Coefficient alpha for the OGO subscale generally has been found to be weaker, with a range from 0.35 to 0.82. The authors also reviewed research supporting convergent validity with related constructs such as acculturation, with small correlations in the expected direction. Finally, Avery, Tonidandel, Thomas, Johnson, and Mack (2007) found evidence that adults from different ethnic groups use “similar conceptual frames when responding to the [MEIM]” (p. 885), supporting its use with individuals from different ethnic groups.

Mayo-Portland Adaptability Inventory 4th Edition. The Mayo-Portland Adaptability Inventory 4th edition (MPAI-4; Malec & Lezak, 2003; Malec, 2005) is a 29-item measure composed of three subscales designed to assess physical, cognitive, emotional, and social functioning for individuals recovering from acquired brain injury including TBI. The Ability Index (12 items) assesses the individual’s physical and cognitive abilities. The Adjustment Index (9 items) assesses mood and emotional functioning. Finally, the Participation Index (8 items) assesses involvement in community activities. Additionally, there are 8 items that may be used to assess pre-injury characteristics (e.g., substance use). Participants are asked to rate questions on a 5-point Likert-type scale ranging from 0 to 4 with lower ratings indicating better functioning. Sample items from the MPAI-4 include “Feeling unsteady, dizzy, light-headed,” “Impaired strength or coordination in one or both hands,” “Problems getting started on activities without
prompting,” and “Responsibilities of independent living and homemaking (such as meal preparation, home repairs and maintenance, personal health maintenance beyond basic hygiene including medication management) but not including managing money.” Participants were asked to complete the Abilities and Participation indices for the current study.

The MPAI-4 has demonstrated adequate reliability using Rasch analysis (person reliability of .78 to .88 and item reliability >.98 for each subscale and total scale). Interrater agreement for individual items also was generally within the acceptable range. In terms of validity, concurrent validity has been demonstrated as the MPAI-4 has been shown to correlate with established measures such as the DRS (Malec & Lezak, 2003). Interrater reliability between individuals with acquired brain injury (ABI), significant others, and staff was generally acceptable, supporting the use of this measure with individuals with brain injuries as self-reporters (Malec & Lezak, 2003). The authors also note there were some significant differences between rating groups and argue this may represent the psychosocial and rehabilitation needs of individuals with brain injury and the needs of their significant others. Although individuals with ABI may reliably complete the MPAI-4, it is not recommended that individuals with severe cognitive impairment complete the measure.

Results

Data preparation. In order to maximize participant data, missing data were excluded pairwise (See Tables 2 and 3 for sample sizes on demographic and injury characteristic variables and Table 6 for predictor variables). Responses for educational achievement pre- and post-injury for two participants were excluded due to respondent error (e.g., reporting higher attainment before than after injury). One participant’s response to current age was excluded due to respondent error. Due to small sample sizes, several categorical demographic variables were
collapsed into fewer categories. Variables for education attainment before and after injury were
dichotomized into high school/GED or less and some college or more. Variables for employment
status before and after injury were dichotomized into unemployed and employed (including part-
time and full-time work). Variables for income before and after injury were categorized into six
categories including $19,999 or less, $20,000 - $39,999, $40,000 - $59,999, $60,000 - $79,999,
$80,000 - $99,999, and more than $100,000.

**Descriptive statistics.** Descriptive statistics for demographic variables and injury
characteristics were conducted. Additionally, chi-square tests of independence and independent
sample *t*-tests between Caucasians and racial minorities were used to identify any differences
between groups on demographic variables and injury characteristics. Analyses revealed
Caucasians and racial minorities did not significantly differ on any demographic variable or
injury characteristic (See Tables 2 and 3).

| Demographics and Injury Characteristics | Racial Minorities M (SD) | Caucasians M (SD) | *t* | *p*
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age currently (n = 57)*</td>
<td>44.40 (4.18)</td>
<td>42.94 (1.82)</td>
<td>-0.33</td>
<td>.74</td>
</tr>
<tr>
<td></td>
<td>n = 10</td>
<td>n = 47</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 10</td>
<td>n = 47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years post injury (n = 58)</td>
<td>11.30 (3.72)</td>
<td>12.10 (1.41)</td>
<td>0.23</td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td>n = 10</td>
<td>n = 47</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 7</td>
<td>n = 37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* One participant (Caucasian) was excluded due to respondent error for current age. Age at
injury was derived by subtracting number of years post injury from current age.

**Sample size decrease due to missing data from 14 participants.**
Table 3

Demographics and Injury Characteristics for Racial Minorities and Caucasians for Categorical Variables

<table>
<thead>
<tr>
<th>Demographics and Injury Characteristics</th>
<th>Racial Minorities</th>
<th>Caucasians</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (n = 58)</td>
<td></td>
<td></td>
<td>0</td>
<td>.99</td>
</tr>
<tr>
<td>Male</td>
<td>5 8.6</td>
<td>24 41.4</td>
<td>0.04</td>
<td>.83</td>
</tr>
<tr>
<td>Female</td>
<td>5 8.6</td>
<td>24 41.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Pre-Injury (n = 56)</td>
<td></td>
<td></td>
<td>0.04</td>
<td>.83</td>
</tr>
<tr>
<td>High school/GED or less</td>
<td>2 3.6</td>
<td>12 21.4</td>
<td>0.55</td>
<td>.46</td>
</tr>
<tr>
<td>Some college or more</td>
<td>7 12.5</td>
<td>35 62.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Post-Injury (n = 56)</td>
<td></td>
<td></td>
<td>0.11</td>
<td>.74</td>
</tr>
<tr>
<td>High school/GED or less</td>
<td>2 3.6</td>
<td>6 10.7</td>
<td>1.65</td>
<td>.20</td>
</tr>
<tr>
<td>Some college or more</td>
<td>7 12.5</td>
<td>41 73.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment Pre-Injury (n = 58)</td>
<td></td>
<td></td>
<td>0.11</td>
<td>.74</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3 5.2</td>
<td>12 20.7</td>
<td>1.65</td>
<td>.20</td>
</tr>
<tr>
<td>Employed</td>
<td>7 12.1</td>
<td>36 62.1</td>
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<tr>
<td>Employment Post-Injury (n = 58)</td>
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<td></td>
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<td>.20</td>
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<tr>
<td>Unemployed</td>
<td>8 13.8</td>
<td>28 48.3</td>
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<tr>
<td>Employed</td>
<td>2 3.4</td>
<td>20 34.5</td>
<td></td>
<td></td>
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<td>Income Pre-Injury (n = 56)</td>
<td></td>
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<td>2.28</td>
<td>.81</td>
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<tr>
<td>$19,999 or less</td>
<td>2 3.6</td>
<td>10 17.9</td>
<td></td>
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</tr>
<tr>
<td>$20,000-$39,999</td>
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</tr>
<tr>
<td>$40,000-$59,999</td>
<td>1 1.8</td>
<td>8 14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$60,000-$79,999</td>
<td>2 3.6</td>
<td>5 8.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$80,000-$99,999</td>
<td>0 0</td>
<td>3 5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\geq$100,000</td>
<td>3 5.4</td>
<td>8 14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Post-Injury (n = 56)</td>
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<td>2.43</td>
<td>.79</td>
</tr>
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<td>$19,999 or less</td>
<td>3 5.4</td>
<td>17 30.4</td>
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<td></td>
</tr>
<tr>
<td>$20,000-$39,999</td>
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<td>5 8.9</td>
<td></td>
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</tr>
<tr>
<td>$80,000-$99,999</td>
<td>0 0</td>
<td>5 8.9</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0 0</td>
<td>2 3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBI Etiology (n = 58)</td>
<td></td>
<td></td>
<td>3.36</td>
<td>.34</td>
</tr>
<tr>
<td>MVC</td>
<td>6 10.3</td>
<td>35 60.3</td>
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<td></td>
</tr>
<tr>
<td>Fall</td>
<td>1 1.7</td>
<td>7 12.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal violence</td>
<td>2 3.4</td>
<td>2 3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 1.7</td>
<td>4 8.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOC (n = 57)</td>
<td></td>
<td></td>
<td>6.13</td>
<td>.19</td>
</tr>
<tr>
<td>&lt; 30 minutes</td>
<td>4 7.0</td>
<td>11 19.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 30 minutes, &lt; 1 day</td>
<td>2 3.5</td>
<td>2 3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 1 day, &lt; 1 week</td>
<td>1 1.8</td>
<td>7 12.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 1 week, &lt; 1 month</td>
<td>1 1.8</td>
<td>19 33.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preliminary analyses. Dropout from participation was noticed. Five participants dropped out immediately (after completing the informed consent) and eight after the demographics section. Therefore, dropout consisted of 13 (18%) participants, excluding those who did not complete informed consent or meet inclusionary criteria.

Means comparison analyses were conducted for each measure (MEIM EI subscale, MPAI-4 Ability Index, and MPAI-4 Participation) for the dependent variable (CIQ) to determine if a pattern of missing data existed. Independent-samples *t* tests were not significant for the MEIM EI subscale, \( t(53) = 0.21, p = .84 \), the MPAI-4 Ability Index, \( t(53) = 0.96, p = .34 \), or the MPAI-4 Participation Index, \( t(53) = -1.32, p = .19 \), suggesting those with missing data did not differ from those with complete responses. Therefore, these results suggest missing data were random. Therefore, to maximize data, values were excluded pairwise.

Identifying potential covariates. Potential covariates (i.e., age at time of injury, years since injury, sex, educational achievement pre-injury and currently, employment status pre-
injury, and annual household income pre-injury and currently, use of a proxy to complete online survey, and injury severity) were identified to determine if they are related to community integration scores using correlation and means comparison analyses. Current employment status was not examined as a potential covariate because the criterion variable, community integration, includes productivity such as employment. Covariates that were identified in preliminary analyses as significant covariates were included in multiple regression analyses (See Table 4).

To identify potential covariates that may be related to the CIQ, Pearson product-moment correlations were computed for the variables of age at the time of injury and years since injury. There was no significant relationship between CIQ and age at the time of injury, $r(54) = .01, p = .97$, nor years since injury, $r(55) = .08, p = .59$. Pearson product-moment correlations also were computed for injury severity using the MPAI-4 Ability Index. There was a significant negative correlation between CIQ and the MPAI-4 Ability Index, $r(41) = -.40, p < .05$, indicating greater problems with cognitive and physical functioning (as an indicator of injury severity) was related to less community integration.

Table 4  
Analysis of Variables Related to CIQ Identified as Potential Covariates

<table>
<thead>
<tr>
<th>Variable</th>
<th>$r$</th>
<th>$t$</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at injury (n = 57)</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years post injury (n = 58)</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical treatment received</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPAI-4: Ability Index (n = 44)</td>
<td>-.40*</td>
<td>2.25*</td>
<td></td>
</tr>
<tr>
<td>Use of a Proxy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>-0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Pre-Injury</td>
<td>-0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Post-Injury</td>
<td>-2.71*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment Pre-Injury</td>
<td>-0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Pre-Injury</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Post-Injury</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBI Etiology</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOC</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$
Independent-samples $t$-tests were conducted on the variables of sex and use of a proxy to complete the online survey. The test was not significant for sex, $t(53) = -0.95, p = .35$, but was significant for use of a proxy, $t(53) = 2.25, p < .05$, suggesting that those using a proxy reported less community integration ($M = 13.31, SD = 7.26$) compared to those who completed the survey without help ($M = 18.09, SD = 5.54$). Independent-samples $t$-tests also were conducted on the variables of educational achievement pre- and post-injury and employment status pre-injury. Results were not significant for educational achievement pre-injury, $t(51) = -0.62, p = .54$, but were significant post-injury, $t(51) = -2.71, p < .05$, with greater community integration for those with higher levels of educational achievement ($M = 18.37, SD = 5.65$) than for those with lower levels ($M = 12.5, SD = 5.71$). Levene’s Test for Equality of Variances was significant for employment status pre-injury; therefore, tests that do not assume equal variances were used and it was found that differences were not significant, $t(53) = -0.69, p = .50$.

A one-way analysis of variance (ANOVA) was conducted on the variables annual household income pre- and post-injury. The ANOVA was not significant for annual household income before injury, $F(5, 52) = 0.21, p = .96$, or after, $F(5, 52) = .39, p = .85$. Additionally, ANOVAs were conducted for injury characteristic variables of LOC duration and type of injury. Neither duration of LOC, $F(4, 54) = 0.93, p = .45$, nor type of injury, $F(3, 54) = 0.62, p = .61$, were statistically significant.

Based on results from preliminary analyses, the following covariates to be included in the primary analysis (see below) were as follows: MPAI-4 Ability Index scores, educational achievement post-injury, and use of a proxy to complete the online survey.

**Racial minorities and CIQ.** The CIQ was developed and normed on Caucasian survivors of TBI, with norms for racial minorities lacking (Dijkers, 1997). Hart et al. (2005) argued that as
a result the CIQ “has uncertain interpretation in other ethnic groups” (p. 160). Therefore, reliability and validity analyses were conducted within the racial minority sample for the CIQ. Cronbach’s coefficient alpha was .85, suggesting acceptable internal consistency, which is consistent with previous findings described by Djikers et al. (.76 to .90; 1997) and higher than in the original study (.76; Willer et al., 1993). A Pearson product moment correlation was conducted between CIQ and the MPAI-4 Participation Index to investigate convergent validity. A significant relationship was not found, $r(7) = -.69$, $p = .08$, suggesting the CIQ may not be a valid measure of community integration for racial minorities consistent with arguments posed by Hart et al. (2005). However, interpretation is limited by the sample size in this study. Although not significant, the correlation coefficient is large (-.69), and it may be that the lack of significance represents type two error due to sample size limitations rather than reflecting poor convergent validity. In addition, initially convergent validity for the CIQ was assessed using the CHART (Willer et al., 1993). Therefore, it may be that the MPAI-4 Participation Index and the CHART account for somewhat different aspects of injury severity for racial minorities, resulting in differences in the strength of association between these measures and the CIQ.

**Pre-screening data analysis.** Methods for addressing outliers (univariate and multivariate) and assessing assumptions of the data were reviewed. Univariate outliers were examined in continuous variables (i.e., age at the time of injury, years post-injury, CIQ, MEIM EI subscale, MPAI-4 Ability Index, and MPAI-4 Participation Index) via z-scores, with outliers identified based on a cutoff of +/- 3.0 standard deviations. There were no outliers greater than 3.0 standard deviations for these variables. Mahalanobis distance values were used to detect multivariate outliers. As indicated by $\chi^2$ values with $p < .001$ and five degrees of freedom (based on the number of predictors entered in the model), a critical value of 20.52 was used as the
criterion. No subjects’ distance values were greater than the critical value; therefore, there were no outliers identified.

Methods for assessing assumptions of the data (linearity, normality, and homoscedasticity) were examined using a simple residual plot (See Figure 1). The plot did not display a curved shape to indicate non-linearity. The plot points did not form a funnel shape to indicate homoscedasticity. Finally, the data points were equally dispersed above and below the 0-point line (i.e., zero error) to indicate normality. Overall, the shape of the plot appeared “cloud-like.” In addition, the distribution of residuals was examined to determine if the normality assumption was met. Specifically, goodness of fit was assessed via the Shapiro-Wilk test and through examination of the standardized skewness and kurtosis coefficient values. Results of the Shapiro-Wilk test were not significant, indicating a normal distribution. Additionally, standardized skewness and kurtosis coefficient values of residuals were within acceptable limits (less than an absolute value of the respective skewness or kurtosis standard error multiplied by two) and the distribution plot revealed a normal distribution (See Figure 2). Further, normality of continuous dependent (i.e., CIQ) and independent (i.e., MPAI-4 Ability Index and MEIM EI subscale) measures were assessed via the Shapiro-Wilk test and by examining skewness and kurtosis coefficients, which also were within acceptable limits. Multicollinearity was assessed by examining bivariate correlations among the predictor variables, with a cut-off of > .90 suggestive of multicollinearity. All correlations were within acceptable limits (See Table 5). Additionally, to assess excessive overlap among three or more predictors tolerance coefficients were examined with a cut-off of < .20 suggestive of multicollinearity. Again, all variables were within acceptable limits.
Table 5
Bivariate Correlations, Means, and Standard Deviations among Predictors

<table>
<thead>
<tr>
<th></th>
<th>Proxy</th>
<th>MPAI-4</th>
<th>Education</th>
<th>Race</th>
<th>MEIM</th>
<th>CIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proxy</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPAI-4</td>
<td>.12</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-.66**</td>
<td>-.30*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>-.07</td>
<td>.03</td>
<td>-.10</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEIM</td>
<td>-.47</td>
<td>-.17</td>
<td>.27*</td>
<td>-.20</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>CIQ</td>
<td>-.30*</td>
<td>-.40**</td>
<td>.35*</td>
<td>.05</td>
<td>.03</td>
<td>--</td>
</tr>
</tbody>
</table>

n 44 58 56 58 51 55
M 16.93 0.16 0.86 0.17 29.80 17.30
SD 10.46 .37 .35 0.38 6.86 6.05

* p < .05
** p < .001

Figure 1. Simple residual plot assessing assumptions of the data (linearity, normality, and homoscedasticity).
Primary Analysis. The following was hypothesized for the current study: 1) covariates identified as significant during preliminary analyses would be predictive of community integration following TBI; 2) race would be predictive of community integration following TBI such that minority racial status would predict poorer community integration; and 3) after controlling for other variables, greater ethnic identity will be predictive of greater community integration following TBI. After determining that assumptions of the data were met, a hierarchical multiple regression analysis was used to test the hypotheses. The criterion variable
was community integration (measured by the CIQ total score) and predictor variables were ethnic identity (measured by MEIM EI subscale), race, and significant covariates identified during preliminary analyses (MPAI-4 Ability Index, educational achievement post-injury, and use of a proxy to complete online survey). Using IBM SPSS Statistics 20.0, significant covariates identified in the preliminary analyses were entered into the model first. Then in the second step (model or block) the predictor variable race was entered into the regression model. Finally, in the third step, the predictor variable ethnic identity was entered into the regression model. Dichotomous and categorical demographic covariates were dummy coded (high school or less = 0, some college or more = 1; no proxy = 0, use of proxy = 1; Caucasians = 0, racial minorities = 1).

After accounting for missing data, which were excluded pairwise (see Table 6 for summary of missing data in hierarchical regression), the linear combination of predictor variables in step 1 (MPAI-4 Ability Index, educational achievement post-injury, and use of a proxy to complete online survey) was significantly related to the CIQ, $F(3, 37) = 3.79, p = 0.02$. It was found that 24% ($\text{Adjusted } R^2 = 0.17$) of the variance community integration (measured by the CIQ) was explained by the linear combination of predictors in step 1. The model remained significant when race was added to the model ($F(4, 36) = 2.82, p = 0.04$), but the change in $R^2$ was not significant, $F(1, 36) = 0.17, p = .69$, with < 1% ($\Delta R^2 = .004$) of additional variance explained by race. When MEIM EI subscale was added, the model was no longer significant, $F(5, 35) = 2.25, p = 0.07$, which may reflect overlap in variance explained by variables in the model. Next, individual predictors were examined. Specifically, regression coefficients, tests of significance ($t$-values), confidence intervals, effect size, and part and partial correlation
coefficients were examined (See Table 7). Results show the MPAI-4 Ability Index as the only significant predictor of community integration yielding the following regression equation:

\[ \hat{Y} = 18.78 - 0.34_{\text{MPAI-4 Ability}} \]

Therefore, having fewer cognitive and physical problems predicted better community integration.

**Table 6**
Summary of included and missing data for predictors included in hierarchical regression analysis

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Racial Minorities</th>
<th>Caucasians</th>
<th>Total Included</th>
<th>Missing Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>MPAI-4: Ability Index</td>
<td>7</td>
<td>37</td>
<td>44(75.9)</td>
<td>14(24.1)</td>
</tr>
<tr>
<td>Education Post-Injury</td>
<td>9</td>
<td>47</td>
<td>56(96.6)</td>
<td>2(3.4)</td>
</tr>
<tr>
<td>Use of a Proxy</td>
<td>10</td>
<td>48</td>
<td>58(100)</td>
<td>0(0)</td>
</tr>
<tr>
<td>MEIM</td>
<td>8</td>
<td>43</td>
<td>51(87.9)</td>
<td>7(12.1)</td>
</tr>
</tbody>
</table>

**Table 7**
Results of Individual Predictors at Each Step of Hierarchical Regression Analysis

<table>
<thead>
<tr>
<th>Predictors</th>
<th>95% CI</th>
<th>( \hat{\beta} )</th>
<th>Lower</th>
<th>Upper</th>
<th>( t )</th>
<th>( r )</th>
<th>( sr^2 )</th>
<th>( pr^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td>Use of Proxy</td>
<td>-.16</td>
<td>-8.97</td>
<td>3.86</td>
<td>-.81</td>
<td>-.30</td>
<td>0.01</td>
</tr>
<tr>
<td>MPAI-4: Ability Index</td>
<td></td>
<td>-.34</td>
<td>-.37</td>
<td>-.02</td>
<td>2.23*</td>
<td>-.40</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td>Education Attainment Post-Injury</td>
<td></td>
<td>.15</td>
<td>-4.31</td>
<td>9.50</td>
<td>.76</td>
<td>.35</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td>Use of Proxy</td>
<td>-.14</td>
<td>-8.92</td>
<td>4.29</td>
<td>-.71</td>
<td>-.30</td>
<td>0.01</td>
</tr>
<tr>
<td>MPAI-4: Ability Index</td>
<td></td>
<td>-.34</td>
<td>-.37</td>
<td>-.01</td>
<td>2.19*</td>
<td>-.40</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td>Education Attainment Post-Injury</td>
<td></td>
<td>.17</td>
<td>-4.26</td>
<td>9.99</td>
<td>.82</td>
<td>.35</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>.06</td>
<td>-3.82</td>
<td>5.75</td>
<td>.41</td>
<td>.05</td>
<td>&lt;.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td>Use of Proxy</td>
<td>-.13</td>
<td>-8.85</td>
<td>4.66</td>
<td>-.63</td>
<td>-.30</td>
<td>0.01</td>
</tr>
<tr>
<td>MPAI-4: Ability Index</td>
<td></td>
<td>-.34</td>
<td>-.38</td>
<td>-.02</td>
<td>2.20*</td>
<td>-.40</td>
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<td>0.12</td>
</tr>
<tr>
<td>Education Attainment Post-Injury</td>
<td></td>
<td>.19</td>
<td>-4.17</td>
<td>10.78</td>
<td>.90</td>
<td>.35</td>
<td>0.02</td>
<td>0.02</td>
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<tr>
<td>Race</td>
<td></td>
<td>.05</td>
<td>-4.11</td>
<td>5.69</td>
<td>.33</td>
<td>.05</td>
<td>&lt;.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>MEIM EI Subscale</td>
<td></td>
<td>-.07</td>
<td>-.35</td>
<td>.22</td>
<td>-.45</td>
<td>.03</td>
<td>&lt;.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*Note. CI = Confidence Interval

* \( p < .05 \)
Discussion

The current study investigated the predictive power of ethnic identity on community integration for TBI survivors of various racial backgrounds after accounting for important demographic and injury characteristics. Consistent with hypotheses, severity of injury inferred by experience of current cognitive and physical problems, as measured by the MPAI-4 Ability Index, was predictive of community integration; however, contradictory to hypotheses, no other demographic or injury characteristics were significant. Also contradictory to hypotheses, neither race nor ethnic identity was predictive of community integration.

Cognitive and physical problems that can interfere with daily functioning often persist following severe TBI. Spitz, Ponsford, Rudzki, and Maller (2012) found cognitive ability, especially executive functions, to be a better predictor of functional outcome over the first year of recovery than demographic and injury characteristics. Previous research has also found greater levels of disability to be predictive of lower levels of home, social, and productive community integration (Heinemann & Whiteneck, 1995), which is consistent with the current findings that more cognitive and physical problems predicts less community integration. In terms of returning to work and school (a part of community integration), cognitive functioning, among other variables, also has been found to be related to these outcomes (Ip, Dornan, & Schentag, 1995). In addition to finding that more cognitive and psychosocial problems were related to academic challenges among college students with TBI, Kennedy, Krause, and Turkstra (2008) found that less than half of these students accessed college campus student disability services with 20% unaware that services were available.

Contrary to previous research (Bushnik et al., 2003; Gerhart et al., 2006; Linden et al., 2005; Harrison-Felix et al., 1998; Hart et al., 2005; Heinemann & Whiteneck, 1995; Huebner et
The current study did not find that demographic or injury characteristics (i.e., education, age, gender, years post injury, type of injury, and premorbid employment status) other than cognitive and physical problems predict community integration among TBI survivors. Additionally, race did not predict community integration despite findings otherwise by other researchers (Arango-Lasprilla et al., 2007a; Arango-Lasprilla et al., 2007b; Arango-Lasprilla et al., 2008a; Arango-Lasprilla et al., 2008b; Arango-Lasprilla et al., 2009; Haider et al., 2007; Hart et al., 2005; Rosenthal et al., 1996; Sherer et al., 2003). One explanation may be the possibility of ongoing access to resources post-injury. Although broad attempts at recruitment were made, many of the recruitment sources most capable and willing to assist in recruitment were resources for TBI survivors such as support groups. Working with organizations that provide resources to TBI survivors is an effective and common way to reach this population; however, this method also introduces sample bias such that those with access to these resources are reached most easily.

There is some evidence that when racial minorities have access to resources, disparities in outcome diminish. For example, Johnstone et al. (2003) found no differences in employment obtainment between African American and Caucasian TBI survivors when all individuals completed a vocational rehabilitation program. Additionally, Burnett et al. (2003) found racial minorities did not differ on most outcome variables of functional ability following rehabilitation even though disparities in health care services received between racial minorities and Caucasians were found. In the current study, participants were not asked how they learned of the study, or what TBI resources for which they had access; therefore, it not known if this did or did not play a role in explaining a lack of differences between racial groups.
A similar explanation may also account for the finding that ethnic identity also was not related to community integration. Ethnic identity offers a greater sense of membership among one’s ethnic group, which can make other social resources for coping accessible. For example, Lopez, Antoni, Fekete, and Penedo (2012) found that among Latina women who were HIV positive, greater ethnic identity provided the women with more social support to cope with their illness, resulting in lower levels of perceived stress. Therefore, again, participants’ access to resources may play a role in explaining the results in the current study such that participants may have heard of the study through supportive resources for which they had access.

Another important consideration is the impact of disability (i.e., cognitive and physical problems) and race as areas of potentially experienced stigma. When perceived by others, visible disability relative to other characteristics, such as race, has been found to be more salient. Rohmer and Louvet (2009) asked French undergraduate college students to provide descriptions of drawings of individuals (depicted with or without a visible disability, male or female, and racially Black or White). The authors found that disability was a more salient descriptor than race and gender. Additionally, drawings of able-bodied people (depicted by standing with a bicycle) were not described as “able-bodied” whereas people depicted in a wheelchair were described as disabled. Therefore, it may be that disability (i.e., greater cognitive and physical problems) may be perceived as more salient than race by others, which can indirectly impact outcomes like community integration (e.g., attempts at obtaining employment). Although Rohmer and Louvet found disability to be a more salient perceived characteristic, a similar response pattern was found for race such that White people were not described as White, whereas Black people were described by their race.
Disability acquired from a TBI often presents as an invisible disability (e.g., cognitive problems), which McClure (2011) argues can lead to others’ misattribution of a TBI survivor’s behavior. For example, McClure, Buchanan, McDowall, and Wade (2008) presented a vignette and photograph of an adolescent who sustained a TBI. The photograph depicted the individual either with or without a visible cue of the injury by a head scar. The researchers found that people attributed behaviors differently based on the presence of a visible cue of disability (i.e., head scar). With a scar, behavior was attributed to both the injury and adolescence. In the absence of a scar, the individual’s behavior was attributed to adolescence more than the effects of sustaining a head injury. Additionally, the individual without a scar was judged to have a less severe injury than the individual with a scar.

Salience of visible disability and misattribution of invisible disability by others are both possible experiences for TBI survivors. The TBI survivor’s own experience of his or her own multiple identities (e.g., race and disability) in terms of saliency may be different than that of which is perceived by others. The term double jeopardy was developed in reference to the experience of African American women who experienced multiple oppression as both women and African American (Vernon, 1999). The concept of double jeopardy, or multiple or simultaneous oppression, has been generalized to individuals that experience multiple areas of non-privilege, and the possible compounding effects as a result, which include disability and race. However, Vernon (1999) argues the concept of simultaneous oppression is too simple and does not capture the complex and fluctuating relationship among a person’s experience of multiple identities, the environment, and society.

For some, an existing minority status may influence a person’s daily life much more than his or her disability; yet for others, the disability is the most prominent experience; and
still for others, the multiple minority roles weigh heavily on the person’s daily existence with no more or less significance than others. It can be hypothesized that for some individuals, one minority status leads to another (Chan, da Silva Cardoso, & Chronister, 2009, p. 485).

Further, the salience of one aspect of a person’s identity may change depending on the context (Vernon, 1999). For the current study, it is important to consider the sample characteristics in making interpretations about the results in terms of disability and race. As a primarily Caucasian sample, it is not surprising that disability becomes a more salient variable as racial oppression is less likely experienced among this population.

Considering the sample characteristics (i.e., primarily Caucasian) also may help explain the results regarding ethnic identity. Ethnic identity has been found to be related to positive outcomes across racial groups, including Caucasians. For a sample of African American, Latino, and Caucasian adolescents, ethnic identity was found to be predictive of self-esteem for all three racial groups (Phinney, Cantu, & Kurtz, 1997). However, others have not found ethnic identity to predict self-esteem among Caucasians (Goodstein & Ponterotto, 1997). The salience of ethnic identity also can vary between individuals and ethnic/racial groups as well as over time (Phinney & Ong, 2007). Phinney and Alipuria (1990) found that ethnic identity was more salient for racial minorities than for Caucasians. Additionally, they found that although ethnic identity commitment (investment in one’s ethnic identity) was related to self-esteem for all participants, this was especially true for racial minorities. Therefore, ethnic identity may not have been as salient or as strong a resource for coping among the current sample of primarily Caucasian survivors of TBI.

The CIQ and Racial Minorities
The CIQ is a widely used measure of community integration for survivors of TBI; however, norms for racial minorities are lacking (Dijkers, 1997). Additionally, Hart et al. (2005) have questioned the validity of the CIQ for racial minorities, arguing that the CIQ and similar measures may “emphasize outcomes and activities of more relevance to whites” (p. 160) than other cultural groups. Therefore, reliability and validity was examined for the CIQ among racial minorities in the current study. Although the CIQ demonstrated acceptable reliability, results of convergent validity by the MPAI-4 Participation Index resulted in questionable validity of the measure for racial minorities. However, interpretation of these results is difficult. First, a small sample size of racial minorities in the current study compromises the statistical power and generalizability of the analyses. Second, the MPAI-4 Participation Index was developed on a primarily Caucasian sample (Malec & Lezak, 2003) and may be susceptible to some of the same problems as the CIQ in terms of cultural sensitivity. Sander, Clark, and Pappadis (2010) argue both measures lack “a method to address individual differences in priorities” (p. 123) that may be influenced by an array of diversity factors including cultural values.

Limitations

A significant limitation of the current study is the sample size for the racial minority group, which decreased statistical power. The percentage of racial minorities with TBI included in previous studies’ research samples ranges greatly from less than 10% to approximately half. According to the CDC, the approximate percentage of racial minorities sustaining a TBI annually is 24%, based on data collected from 2002-2006 (CDC, 2010). In the current study, 82.8% of the sample was Caucasian. Additionally, the racial minority sample in the current study lacked participation from some commonly included racial groups (i.e., African Americans and Asians). Rather, the racial minority sample was primarily Latino and Native American, which is
interesting because Native Americans are frequently one of the most under-represented groups in this area of research. Therefore, interpretations are limited due to decreased power due to small sample sizes.

Given TBI survivors often experience ongoing cognitive problems, and cognitive and physical problems were a significant finding in the current study, it is important to consider the reliability of participants’ responses to the survey items. For example, cognitive problems may have contributed to the number of participants who did not complete the informed consent successfully or errors noted on some demographic questions. The MEIM has never been administered to a sample of TBI survivors, thus the psychometric properties of this measure for this population are unknown. The CIQ and the MPAI-4, however, both were developed to be suitable for TBI survivor responders. Although, there is mixed evidence that TBI survivors provide reliable responses on the CIQ (Willer et al., 1993; Dijkers, 1997). The CIQ also was developed as a measure to be administered by telephone or in-person and the psychometric properties have not been investigated when administered as part of a web-based survey. For the MPAI-4, interrater agreement among individuals with ABI, significant others, and staff were generally acceptable, but significant differences did exist (Malec & Lezak, 2003). The authors noted differences may represent clinically useful information and the measure is designed to attain ratings from multiple sources to provide greater clinically relevant information. Notably, it is not recommended that individuals with severe cognitive impairment complete the MPAI-4.

Using the internet for data collection, such as a web-based survey like the one used in the current study, is a relatively new research method with many advantages and disadvantages. Hoonakker and Carayon (2009) identified advantages including easy access to worldwide
populations, reduced cost, and ease and speed of administration. The authors also identified challenges including sampling and measurement error and computer literacy.

Many of the same difficulties in older forms of mail-in or postal surveys remain with the use of internet-based surveys. For example, omitted items and missing data continue to be problematic. However, in a literature review of postal versus internet surveys (i.e., email and web-based surveys), Hoonakker and Carayon (2009) found few differences in the number of omitted items. Web-based surveys may include design controls that require respondents to answer certain or all questions; however, reasons for not responding can vary (e.g., accidental or intentional). There is concern that design controls requiring answers may lead to participation dropout (Hoonakker & Carayon, 2009), for example, if a participant intentionally chooses not to answer an item. A creative solution may be to require all items have a response, but providing a response option “choose not to answer” to respect participants’ choice while minimizing respondent errors (i.e., accidentally missing an item).

Dropout is another methodological concern; therefore, it is important to attempt to minimize dropout when employing internet surveys. In a sample of college students, Hoerger (2010) found an immediate dropout rate of 10% with an additional 2% dropout after every 100 questions. In the current study, there was a dropout rate of 18%; however, it is not known if this is within normal limits for a sample of TBI survivors as opposed to college students as in Hoerger’s study. Additionally, in the current study, reasons for dropout are unknown. For example, participants may have dropped out due to problems related to injury characteristics (i.e., cognitive problems), survey content, survey length, internet connection problems, etc.

Although web-based surveys present many opportunities, few researchers have used online questionnaires with TBI survivors. There may be special considerations for using this type
of data collection method for a brain injured population. Vaccaro, Hart, Whyte, and Buchhofer (2007) found less internet use among TBI survivors compared to the U.S. population; however, among survivors that do use the internet, use is similar to the U.S. population. Non-users identified lack of knowledge (i.e., computer literacy) as a barrier to internet use. Tsaousides, Matsuzawa, and Lebowitz (2011) found 60% of TBI survivors surveyed reported using an online social media website (Facebook) regularly. Non-users identified barriers of concern about security and interference of cognitive deficits. Notably, in both of these studies, non-users typically were interested in learning to use the internet or Facebook.

Despite limitations, online tools may be useful for research data collection. Egan, Chenoweth, and McAuliffe (2006) successfully used email to conduct qualitative interviews with TBI survivors and found participants reported preferring email to face-to-face interviewing, having more time to reflect upon answers, and having a greater sense of control of the interview environment. Additionally, participants reported advantages to being able to see and read their responses in terms of overcoming cognitive problems (e.g., memory, attention).

**Future Directions**

Exploration of the intersections of visible and invisible disability and race for TBI survivors should be explored in future research to help identify protective and risk factors for outcome. The current study supports previous research that cognitive and physical problems continue to present as barriers to community integration; however, racial differences were not found, contrary to previous research. Future research should continue to investigate and identify factors that might explain discrepant findings across studies in terms of differences between racial groups.
Additionally, future research may investigate access to and use of resources among different racial groups. Although disparities in healthcare have already been discussed, it may be that racial minorities access and use a different means of support than Caucasian TBI survivors. Although there are challenges involved in obtaining a representative sample of racial minorities, future research should continue to identify and employ methods of including racial minorities in TBI research. A better understanding of the resources racial minority TBI survivors access may offer potential opportunities for recruitment contacts in the community.

In terms of outcome, future research should develop a more meaningful and culturally inclusive definition and measurement of community integration. Sander, Pappadis, Clark, and Struchen (2011) investigated meaning of community integration among African American, Hispanic, and Caucasian TBI survivors. Among other findings, African Americans and Hispanics emphasized the importance of domestic activities more than Caucasian individuals. However, Sander et al. (2010) also argue that “[t]o create a measure that is truly culturally competent will require input from diverse groups prior to item generation” (p. 124).

Conclusions

More cognitive and physical problems predict lower levels of community integration, whereas other examined demographic and injury characteristics, including race and ethnic identity, did not in the current study. Although the results of the current study seem to suggest that disability is more salient among TBI survivors than other variables (i.e., race, ethnic identity, and other demographic variables) despite contrary findings in previous research, it is important to consider the sample characteristics. Among a primarily Caucasian sample, disability is a salient variable in terms of outcome; however, conclusions on the impact of race and disability among TBI survivors is limited by the small number of racial minorities included. Overall,
ongoing cognitive and physical problems negatively impact community integration outcome among all TBI survivors.
References


Uniform Data Set for Medical Rehabilitation (http://udsmr.org/Default.aspx).


Appendix

Survey Demographic Questions

1. Gender
   - Male
   - Female
   - Other: ____________________

2. Current Age: ______

3. Years since injury: ______

4. Before the head injury, were you diagnosed with any neurological disorders such as seizure disorder or dementia?
   - Yes
   - No

5. Race (check as many as apply)
   - Native American/Native Alaskan
   - Asian
   - African American
   - Latino
   - Native Hawaiian/Pacific Islander
   - Caucasian
   - Other: __________________

6. In which U.S. state do you currently live? ______

7. Highest education pre-injury
   - Less than high school
   - High school/GED
   - Some college
   - 2-year college degree (e.g., AA)
   - 4-year college degree (e.g. BS, BA)
   - M.A./M.S.
   - Doctoral
   - Other: __________________

8. Highest education currently
   - Less than high school
   - High school/GED
   - Some college
   - 2-year college degree (e.g., AA)
   - 4-year college degree (e.g. BS, BA)
   - M.A./M.S.
   - Doctoral
   - Other: __________________

9. Employment status pre-injury
   - Unemployed, not seeking employment
   - Unemployed, seeking employment
   - Employed part-time (20 hours or less a week)
   - Employed full-time (more than 20 hours a week)

10. Employment status currently
    - Unemployed, not seeking employment
☐ Unemployed, seeking employment
☐ Employed part-time (20 hours or less a week)
☐ Employed full-time (more than 20 hours a week)

11. Annual household income pre-injury
☐ $9,999 or less
☐ $10,000-$19,999
☐ $20,000-$29,999
☐ $30,000-$39,999
☐ $40,000-$49,999
☐ $50,000-$59,999
☐ $60,000-$69,999
☐ $70,000-$79,999
☐ $80,000-$89,999
☐ $90,000-$99,999
☐ 100,000 or more per year

12. Annual household income currently
☐ $9,999 or less
☐ $10,000-$19,999
☐ $20,000-$29,999
☐ $30,000-$39,999
☐ $40,000-$49,999
☐ $50,000-$59,999
☐ $60,000-$69,999
☐ $70,000-$79,999
☐ $80,000-$89,999
☐ $90,000-$99,999
☐ 100,000 or more per year

13. Some people with history of TBI will require another person’s help to read, understand, remember, or type in responses to this survey. Is someone assisting you to complete this survey?
☐ Yes (This is okay, but it is very important that your responses are your own)
☐ No

14. Did you sustain a significant traumatic brain injury such as from a motor vehicle collision or fall in which you lost consciousness?
☐ Yes
☐ No

15. How did you sustain your head injury?
☐ Motor vehicle collision
☐ Fall
☐ Personal violence
☐ Other: _______________

16. For what duration did you lose consciousness?
☐ Less than 30 minutes
☐ More than 30 minutes but less than 1 day
☐ More than 1 day but less than 1 week
☐ More than 1 week but less than 1 month
17. Did you require medical treatment? Please check all that apply.
   - Emergency room evaluation (may or may not include brain imaging such as CT scan or MRI)
   - Follow-up doctor’s appointment
   - Intensive care for any period of time
   - Overnight hospital stay
   - Hospital stay for longer than one night
   - Inpatient rehabilitation therapies while still in hospital
   - Outpatient rehabilitation therapies

18. When was your first memory after the TBI?
   - Being at the scene where the head injury occurred
   - Being in the ambulance
   - Being in the hospital emergency room
   - More than 1 day later but less than 1 week after the TBI
   - More than 1 week later but less than 2 weeks after the TBI
   - More than 2 weeks later but less than 1 month after the TBI
   - More than 1 month after the TBI