



# HHS Public Access

Author manuscript

*Arch Phys Med Rehabil.* Author manuscript; available in PMC 2018 February 14.

Published in final edited form as:

*Arch Phys Med Rehabil.* 2017 April ; 98(4): 751–758. doi:10.1016/j.apmr.2016.11.016.

## Effectiveness of an Educational Intervention on Reducing Misconceptions Among Ethnic Minorities With Complicated Mild to Severe Traumatic Brain Injury

Monique R. Pappadis, PhD<sup>a,b,c</sup>, Angelle M. Sander, PhD<sup>b,d,e</sup>, Beata Łukaszewska, PhD<sup>f</sup>, Margaret A. Struchen, PhD<sup>b</sup>, Patrick Leung, PhD<sup>c</sup>, and Dennis W. Smith, PhD<sup>a</sup>

<sup>a</sup>Department of Health and Human Performance, University of Houston, Houston, TX <sup>b</sup>Brain Injury Research Center, TIRR Memorial Hermann, Houston, TX <sup>c</sup>Graduate College of Social Work, University of Houston, Houston, TX <sup>d</sup>Departments of Physical Medicine and Rehabilitation & Beth K. and Stuart C. Yudofsky Division of Neuropsychiatry, Department of Psychiatry, Baylor College of Medicine, Houston, TX <sup>e</sup>Harris Health System, Department of Physical Medicine and Rehabilitation, Center for Neurotrauma Rehabilitation, Houston, TX <sup>f</sup>Division of Clinical Neuropsychology and Psychology, University of Gdansk, Gdansk, Poland

### Abstract

**Objective**—To evaluate the effectiveness of an educational intervention designed to reduce traumatic brain injury (TBI)–related misconceptions among blacks and Latinos with complicated mild to severe TBI.

**Design**—Randomized controlled trial with masked 1-month follow-up.

**Setting**—Community.

**Participants**—Persons (N = 52) with complicated mild to severe TBI (mean best day 1 Glasgow Coma Scale score, 11.27±3.89) were randomly recruited from 141 eligible participants (mean age, 37.71±13.88y; age range, 19–66y; mean months postinjury, 24.69±11.50); 25 participants (48.1%) of participants were black and 27 (51.9%) were Hispanic/Latino. Of the Hispanic/Latino participants, 18 (66.7%) were non-U.S. born and 12 (44.4%) spoke Spanish as their primary language. Twenty-seven individuals were randomized to the educational intervention group and 25 were randomized to the wait-list control group.

**Interventions**—Single-session educational intervention with written materials provided in English or Spanish.

---

**Corresponding author.** Monique R. Pappadis, PhD, Division of Rehabilitation Sciences, School of Health Professions, University of Texas Medical Branch at Galveston, 301 University Blvd, Galveston, TX 77555. mrpappad@utmb.edu. Current affiliation for Pappadis, Division of Rehabilitation Sciences, School of Health Professions, University of Texas Medical Branch at Galveston, Galveston, TX.

Presented in part to the First International Conference on Culture, Ethnicity, and Brain Injury Rehabilitation, May 12–13, 2009, Arlington, VA.

Disclosures: none.

**Main Outcome Measures**—Forty-item Common Misconceptions about Traumatic Brain Injury Questionnaire administered at baseline and 1-month follow-up.

**Results**—After controlling for ethnic and language differences, a significant between-group main effect ( $P = .010$ ) and a significant time-group interaction for the Common Misconceptions about Traumatic Brain Injury Questionnaire were noted (Wilks  $\Lambda = .89$ ;  $F_{1,46} = 6.00$ ;  $P = .02$ ). The intervention group showed a decrease in TBI misconception percentages, whereas the wait-list control group maintained similar percentages. At 1-month follow-up, the wait-list control group reported more misconceptions than did the intervention group ( $P = .019$ ).

**Conclusions**—An educational intervention developed to address the recovery process, common symptoms, and ways to handle the symptoms provides promise as a tool to decrease TBI misconceptions among persons from ethnically and educationally diverse backgrounds. The effects of therapist characteristics and the client-therapist relation on outcomes should be further explored.

### Keywords

Brain injuries; traumatic; Education; Ethnic groups; Minority groups; Rehabilitation

---

Persons with traumatic brain injury (TBI) and their caregivers report needs for information on the management of expected cognitive and emotional changes.<sup>1-5</sup> Unfortunately, educational, socioeconomic, and cultural issues may affect the understanding and application of health information.<sup>6</sup> Inadequate presentation of information and varying levels of readiness to assimilate it may contribute to lack of knowledge among persons with TBI and their caregivers about TBI consequences.<sup>7,8</sup> Furthermore, education provided early in the recovery process may not be recalled once they are in their home environments.<sup>7</sup>

The need to provide accurate information about the consequences of TBI is supported by misconceptions about the recovery process held by the general public.<sup>1,2,9</sup> Misconceptions about coma, memory/amnesia, and the recovery process are frequently reported. Misconceptions have the potential to influence the experience of persons with TBI and their caregivers. Indeed, family members of persons with TBI hold some misconceptions about TBI recovery that are similar to those of the general public. In 1 study,<sup>10</sup> at least 80% of family members of persons with TBI believed that people in a coma are usually aware of their surroundings and that complete recovery from a severe injury is possible if the person with TBI wants it badly enough. College students with TBI hold similar misconceptions about recovery to those without TBI, particularly about coma, retrograde amnesia, and unconsciousness.<sup>11</sup>

Lack of knowledge about TBI may be problematic for minorities, who are less likely to receive TBI-related services beyond acute care.<sup>12-15</sup> Ethnic minorities with TBI have been shown to hold misconceptions about amnesia, rehabilitation, and recovery.<sup>16</sup> Spanish-speaking Hispanics/Latinos reported a greater percentage of misconceptions than did English-speaking blacks and Hispanics/Latinos after controlling for differences in education and active religious practice. Although not well documented in the literature on TBI, cultural factors, such as fatalism, lack of education, or poor literacy, and acculturation can influence

knowledge or perceptions of illness, adherence to treatment, and health care utilization among Hispanics/Latinos,<sup>17–20</sup> which may play a role in misconceptions. Hispanics/Latinos with religious fatalistic cultural norms may believe that fate is unalterable,<sup>21</sup> which could influence how they cope with disability and misattributions of TBI-related symptoms.

Reduced access to TBI education may influence emotional adjustment and participation, as persons with TBI may not understand the reason for TBI-related problems or seek treatment when needed, and may develop emotional distress and social withdrawal. Providing education to persons with TBI supports their ability to advocate for themselves with health care professionals, who may lack expertise in TBI or hold inaccurate beliefs.<sup>22</sup> Education about changes and recovery after TBI could contribute to reduction in the existing outcome disparities between whites and minorities with TBI<sup>23–28</sup> by influencing appropriate treatment-seeking, realistic goal-setting, and overall adjustment.

Existing research provides a basis for the type of education that would most benefit persons with TBI and their caregivers. Kreutzer and colleagues<sup>29–31</sup> showed that the “most important” needs rated by caregivers were receipt of medical information about their relative’s injury and having information delivered in clear, honest language. Rotondi et al<sup>32</sup> documented caregivers’ need to understand the long-term changes and implications during the 4 phases of recovery, including acute inpatient rehabilitation, return home or transition, and return to the community. Respondents frequently misunderstood explanations provided by health care professionals regarding the sequelae and implications of their injuries. Holland and Shigaki<sup>33</sup> recommended a 3-phase model for educating patients and families throughout the recovery process. They recommended that during the community reentry phase, education should emphasize the protracted nature of TBI recovery, management of behavioral/personality changes, community resources, and TBI recovery from patients’ perspectives.

The purpose of the present study was to investigate the effect of an educational intervention to improve knowledge about TBI among blacks and Latinos with complicated mild, moderate, or severe TBI. A culturally appropriate intervention was designed to be easily understood by all persons, regardless of education and socioeconomic backgrounds.

## Methods

### Study design

This study design was a single-center randomized experimental design with masked 1-month follow-up assessment comparing an educational intervention with a wait-list control group (fig 1). The bilingual, bicultural health educator conducted baseline and postintervention assessments. The postintervention assessment was conducted immediately after the intervention. Research assistants who were blinded to study design and group allocation collected the 1-month follow-up assessment. The randomization sequence was computer generated ([www.randomizer.org](http://www.randomizer.org)) and blocked to yield equal allocation of every 10 participants without stratification.<sup>34</sup> Two institutional review boards (Baylor College of Medicine and the University of Houston) and the Harris Health System approved this study. All research participants gave informed written consent to participate in this study.

## Sample size

A power analysis was conducted for a repeated-measures analysis of variance (ANOVA) with 2 measurements (baseline and follow-up) using G\*Power.<sup>35,36</sup> With a power of .82, an  $\alpha$  level of .05, and a medium effect size of .25, a sample size of 52 (26 in each group) is needed to identify significant differences between the intervention and control groups at 2 time points.

## Participants

One hundred forty-one blacks and Hispanics/Latinos were initially enrolled in a master study of social integration after TBI, based on consecutive admission to the neurosurgery service at a county level 1 trauma center in Texas between June 1, 2004, and December 31, 2007. Inclusion criteria for this larger study included medically documented TBI; 18 years of age or older; primary language of English or Spanish; cognitively able to complete an assessment at least 6 months after injury; living at home at least 3 months before evaluation; and residing within 100 miles of research facility.

Exclusion criteria were homeless or institutionalized; preexisting neurological disorder (eg, stroke and progressive dementia); severe psychiatric disorder (eg, schizophrenia or other psychotic disorder); and severe developmental disability (eg, autism and mental retardation). Additional inclusion criteria for the present study were presence of abnormalities on computed tomography or magnetic resonance imaging and race/ethnicity of black or Hispanic/Latino. Persons with uncomplicated mild TBI were excluded. According to the criteria of Williams et al,<sup>37</sup> persons with complicated mild TBI, who have an initial Glasgow Coma Scale (GCS)<sup>38</sup> score in the mild range (13–15) with abnormal computed tomography or magnetic resonance imaging findings, have outcomes that are substantially different from those without abnormal neuroimaging findings. Blacks and Hispanics/Latinos from the previous study reported not receiving information on TBI. Therefore, these groups, which are the largest minority groups at the level 1 trauma center, were targeted for this study.

## Measures

**Common Misconceptions about Traumatic Brain Injury Questionnaire<sup>10</sup>**—The Common Misconceptions about Traumatic Brain Injury Questionnaire (CM-TBI) is a 40-item self-report measure assessing general TBI knowledge in 7 key areas including seat belts/prevention (4 items), brain damage (4 items), brain injury sequelae (9 items), unconsciousness (3 items), amnesia (4 items), recovery (13 items), and rehabilitation (3 items). Examples include “when people are knocked unconscious, most wake up quickly with no lasting effects,” “recovery from brain injury usually is complete in about 5 months,” and “how quickly a person recovers depends mainly on how hard he or she works at recovering.” Numerous published studies have used variations of the CM-TBI to assess TBI knowledge.<sup>9,16,22,39–42</sup> Springer et al<sup>10</sup> proposed 2 scoring schemes: dichotomized categories of “true” or “false” (probably true is considered true; probably false is considered false) and a stringent 4-point scale (any response other than absolutely true or false is considered incorrect). The dichotomized scoring scheme was used in all analyses. For Spanish-speaking participants, a back-translated Spanish version of the CM-TBI was used.

The CM-TBI has shown good internal consistency ( $\alpha = .84$ ) and test-retest reliability ( $\alpha = .82$ ).<sup>16</sup>

## Procedure

Participants were recruited by telephone or mail. A computer-generated random number table was used to randomly select the order of contact of potential participants from the master study database. The health educator completed informed consent and baseline assessment in participants' homes. Two individuals preferred to participate at the research center. After scheduling of the assessment, group allocation was revealed by removing a colored sticker from a fully concealed randomization list.

The baseline assessment consisted of a demographic questionnaire including sex, age, education, race/ethnicity, occupation, nativity, religious practices, marital status, productivity, and income. Information on injury dates, length of acute care stay, best day 1 GCS<sup>38</sup> score, and mechanism of injury was extracted from medical records. Best day 1 GCS score signifies the best or highest GCS score obtained during the first 24 hours after admission. Participants with GCS scores ranging from 3 to 12 received information on moderate to severe TBI, whereas participants with GCS scores ranging from 13 to 15 received information on mild TBI. The baseline assessment also included the CM-TBI,<sup>10</sup> which the interviewer read aloud and documented participants' responses.

The intervention occurred immediately after the baseline assessment for persons randomized to the intervention group. The CM-TBI was administered immediately after the intervention to assess immediate change (postintervention assessment). The control group did not receive an intervention, but still completed baseline and 1-month follow-up assessments. Research assistants blinded to the participant's group assignment completed the follow-up assessment by telephone at 1 month ( $\pm 2$ wk) after baseline. After follow-up, individuals in the control group were offered the in-person intervention, but all declined, preferring to receive the written educational material.

## TBI educational intervention

A single-session educational intervention was administered using a written manual and interactive didactics and discussion. Separate manuals were developed for persons with mild versus moderate to severe TBI, with both English and Spanish versions created for each. Each manual, written at the sixth grade reading level, addressed all the topics listed in table 1. However, the type of symptoms, frequency of symptoms, and course of recovery differ between those with mild TBI and those with moderate to severe TBI. A bilingual, bicultural health educator with TBI experience conducted the 1-hour educational intervention in participants' homes. The session included a combination of didactic presentation and interactive discussion, with tailoring of information to the needs of participants.

Cultural relevance of the intervention was ensured by providing written materials in English or Spanish and at the sixth grade reading level; using a bilingual, bicultural health educator; including language/cultural terms shared by the population; considering the customs of blacks and Hispanics/Latinos; and having brain injury professionals and survivors review the content for accuracy and relevance.<sup>43</sup> Spanish-speaking persons with TBI and professionals

representing various Hispanic/Latino subpopulations (ie, Cuba, Puerto Rico, Mexico, and El Salvador) reviewed the Spanish-language manuals for grammar, accuracy, language, and cultural relevance, which were back-translated by 2 bilingual researchers. Purposeful sampling was used to represent the largest Hispanic/Latino subpopulations in the United States (ie, Mexicans, Puerto Ricans, Salvadorians, and Cubans).<sup>44</sup>

### Statistical analysis

Data analyses were performed using SPSS version 23.0.<sup>a</sup> Outcome measures were assessed for normality using the Kolmogorov-Smirnov test, with no outliers identified. Overall, TBI misconceptions were assessed on the basis of the total number and percentage of incorrect answers on the CM-TBI using the 2-point scoring scheme. Descriptive statistics were performed to examine the sample characteristics. Chi-square and independent-samples *t* test analyses were conducted to compare the intervention and control groups in terms of demographic characteristics, injury-related characteristics, and percentage of misconceptions at baseline assessment. Baseline assessment differences between those receiving mild TBI education and those receiving moderate to severe TBI education were assessed using an independent-samples *t* test.

The CM-TBI was assessed for changes in misconceptions over 3 time points (baseline, postassessment, and 1-mo follow-up) for those randomized to the intervention group by conducting a 1-way repeated-measures ANOVA with simple planned contrasts. A repeated-measures analysis of covariance was conducted to detect a significant change in CM-TBI scores from baseline to 1-month follow-up, irrespective of whether change was different for intervention and control groups, and determine the effect of the intervention. The covariate used in analyses was an ethnic-language group (ie, blacks, English-speaking Hispanics/Latinos, and Spanish-speaking Hispanics/Latinos), which was a stronger predictor of TBI misconceptions than were education and active practice of religion.<sup>16</sup> To detect a clinically meaningful effect of the intervention,  $\eta_p^2$  was used. Where .01 signifies a small, .06 medium, and .14 large effect, a moderate effect size denotes clinically meaningful group differences.

45

### Results

One hundred nineteen of the 141 black and Hispanic/Latino participants in the master study of social integration met inclusion criteria for the present study (see fig 1). The study was conducted from May 2008 until late July 2008. Sixty-one participants gave verbal assent to participation. Three individuals later discontinued participation before obtaining written consent because of incarceration or no longer desiring to participate. Therefore, 58 persons were scheduled to complete baseline assessments. The first 4 individuals were randomly selected to pilot the intervention. However, no changes were suggested and their data were included in the final analyses. The remaining 54 individuals were randomized to either the intervention group or the control group. Six individuals (4 from the intervention group and 2

---

#### Supplier

a. SPSS version 23.0; IBM Corp.

from the control group) did not respond to contact during the 4-week follow-up period. Therefore, data from 27 individuals from the intervention group and 25 individuals from the control group were analyzed. Demographic and injury characteristics of the sample are summarized in table 2. No significant demographic or injury-related differences were found between the intervention and control groups at baseline.

An independent-samples *t* test revealed no significant difference between the intervention group (mean, 32.50±10.23) and the control group (mean, 32.96±10.85) in terms of total percentage of misconceptions on the CM-TBI at baseline assessment ( $t_{56} = .17$ ;  $P = .87$ ). A second independent-samples *t* test showed no differences between baseline CM-TBI scores for individuals who received the mild intervention (mean, 31.79±9.83) and those who received the moderate to severe intervention (mean, 33.09±10.81;  $t_{29} = -.35$ ;  $P = .73$ ).

A 1-way repeated-measures ANOVA with simple planned contrasts was conducted to compare scores on the CM-TBI for those who received the educational intervention at 3 time points: time 1 (baseline assessment), time 2 (postintervention), and time 3 (1-mo follow-up). The means and SDs are presented in table 3. There was a significant effect of time (Wilks  $\Lambda = .65$ ;  $F_{2,25} = 6.69$ ;  $P < .01$ ;  $\eta_p^2 = .35$ ). The decrease in total percentage of misconceptions from baseline to immediately after the intervention was significant ( $F_{1,26} = 13.86$ ;  $P < .001$ ). The decrease in total percentage of misconceptions from baseline to follow-up was also significant ( $F_{1,26} = 4.57$ ;  $P < .05$ ). No significant difference was found between postintervention and 1-month follow-up ( $F_{1,26} = 13.86$ ;  $P = .311$ ). After receiving the educational intervention, participants showed a significant decrease in their percentage of TBI misconceptions from baseline to immediately after the intervention and maintained this reduced percentage of misconceptions at 1-month follow-up.

A repeated-measures analysis of covariance controlling for ethnic and language differences revealed significant group differences in TBI misconception percentage from baseline to follow-up (Wilks  $\Lambda = .92$ ;  $F_{1,48} = 4.12$ ;  $P = .048$ ) with a moderate effect size ( $\eta_p^2 = .079$ ). The intervention group showed a decrease in TBI misconception percentages, whereas the control group maintained similar percentages, even after controlling for ethnic and language differences ( $F_{1,48} = 7.18$ ;  $P = .010$ ), with a large effect size ( $\eta_p^2 = .130$ ). Spanish-speaking Hispanics in the control group reported a greater percentage of misconceptions than did English-speaking participants ( $F_{1,48} = 19.14$ ;  $P < .001$ ). At 1-month follow-up, the control group (mean, 35.00±12.85) reported a greater percentage of misconceptions than did the intervention group (mean, 26.76±11.74) ( $t_{50} = 2.42$ ;  $P = .019$ ;  $\eta_p^2 = .11$ ).

## Discussion

This study aimed to explore the effect of providing education to reduce TBI-related misconceptions among ethnic minorities with TBI. The culturally appropriate educational intervention significantly reduced misconceptions among the intervention group immediately after the intervention and at 1-month follow-up. The intervention group reported a significantly lower percentage of misconceptions than did the control group, even after controlling for ethnic-language. At baseline, Spanish-speaking Hispanics/Latinos

reported a greater percentage of misconceptions than did English-speaking blacks and Hispanics/Latinos. However, Spanish-speaking Hispanics/Latinos who received the educational intervention had a reduction in misconceptions from baseline to postintervention. Unfortunately, the reduction was not maintained at 1-month follow-up, suggesting the need for booster sessions in this group. Providing education on symptoms and recovery, while also giving feedback on identified misconceptions, was overall helpful in reducing reported misconceptions for those in the intervention group.

The educational intervention has implications for improving knowledge of TBI-related symptoms and recovery among patients with TBI, specifically within the 7 areas that were assessed using the CM-TBI. Reducing misconception can help both patients and family members during the transition period from acute care to rehabilitation and return to the community. Educational material must be culturally relevant and understood by each ethnic group to ensure its maximum potential benefit for both patients and family members.

Cultural differences inherent in blacks/African Americans and Hispanics/Latinos with TBI might influence their perception of TBI and rehabilitation.<sup>46</sup> Spanish-speaking Hispanics/Latinos with TBI previously reported a greater percentage of misconceptions than did both English-speaking Hispanics/Latinos and blacks.<sup>16</sup> Greater efforts to support persons with TBI with limited English proficiency are needed, because there is limited research to address their unique experiences and needs after injury. Health disparities continue to exist for blacks and Hispanics/Latinos with regard to access to care and quality of care in the United States.<sup>47</sup> Improving education about symptoms and recovery and services available may improve health care utilization among these groups. Because access to care is often an issue for minorities, providing interventions in peoples' homes may overcome transportation and financial barriers.

The current intervention was provided in participants' homes, and findings may not generalize to other settings. However, providing education in participants' homes compensates for transportation problems that are typical in populations with low education, low income, and TBI. We believe this method helped improve our follow-up rate and allowed the health educator to build rapport with the participants. Because of being brief and cost-effective, it may be applied in diverse settings and tailored to other ethnic groups, such as non-Hispanic whites.

Future studies may explore the relative benefits of providing the intervention via videoconferencing, which would allow the interaction between the therapist and participants, without involving transportation cost. Future research should assess how varying the type and delivery of the educational intervention may improve patient outcomes. In addition, investigating the effects of therapist characteristics and the quality of the client-therapist relation is warranted. Additional research is needed to identify the role that misconceptions play in adjustment to TBI, health behaviors/outcomes, and treatment adherence of persons with TBI through symptom self-management. TBI is widely being accepted as a chronic condition; therefore, it is important to understand how a person's misinformation about their recovery may play a role in self-management of chronic long-lasting symptoms.



## Study limitations

Although the sample size was sufficiently powered, replicating this study using a larger sample may provide greater insight into the effects of the intervention. This study randomly selected individuals who participated in a previous study; therefore, a selection bias may exist, because only those who could be contacted were included in this study. In addition, chronicity of TBI varied in this sample with persons ranging from 6 to 47 months postinjury. The results may not be generalizable to individuals during the first 6 months of injury. The importance of providing information to patients and their family members once they have returned to living in the community has been emphasized.<sup>32,48</sup> The potential effect of cognitive deficits on assimilation of the educational information was not investigated, and this is a topic for future study. Because the injury severity of our sample was at least complicated mild, the results may not be generalizable to those with uncomplicated mild TBI, whose recovery time is shorter and who may benefit from receiving education at an earlier period.

Future studies should investigate the effect of education on multiple outcomes, including emotional adjustment, access to care, and participation outcomes. Furthermore, a longer follow-up period would be ideal for assessing long-term effects of the educational intervention.

## Conclusions

This study aimed to explore the effect of an educational intervention on reducing misconceptions among ethnic minorities with TBI. The educational intervention group reported significantly reduced overall TBI misconceptions than did the control group at 1-month follow-up assessment, even after controlling for potential ethnic and language differences. Identifying cultural factors influencing misconceptions of TBI should be considered during the development and implementation of educational strategies for ethnically diverse populations.

## Acknowledgments

We thank the staff of Harris Health, including Shankar P. Gopinath, MD, BS, and Claudia S. Robertson, MD. We also thank Diana M. Mazzei, MEd, Terri Hudler-Hull, MA, Allison N. Clark, PhD, Lynne C. Davis, PhD, Florene Dixon, BA, and Jay Bogaards, MA, for their contribution to the collection of follow-up data for this study.

Supported by the National Institute on Disability, Independent Living, and Rehabilitation Research (grant nos. H133B031117, 90RT5007, 90DP0028, and 90DP0060); Agency for Healthcare Research and Quality (NIDILRR; grant no. R24HS022134); Claude D. Pepper Older Americans Independence Center (grant no. 5P30-AG024832) funded by the National Institute on Aging (NIA), part of the U.S. Department of Health and Human Services; and the Competitive Graduate Student Research Award from the University of Houston College of Education, Department of Health and Human Performance. The NIDILRR is a center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this publication do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the federal government. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality or the National Institute on Aging, part of the U.S. Department of Health and Human Services.

## List of abbreviations

**ANOVA** analysis of variance

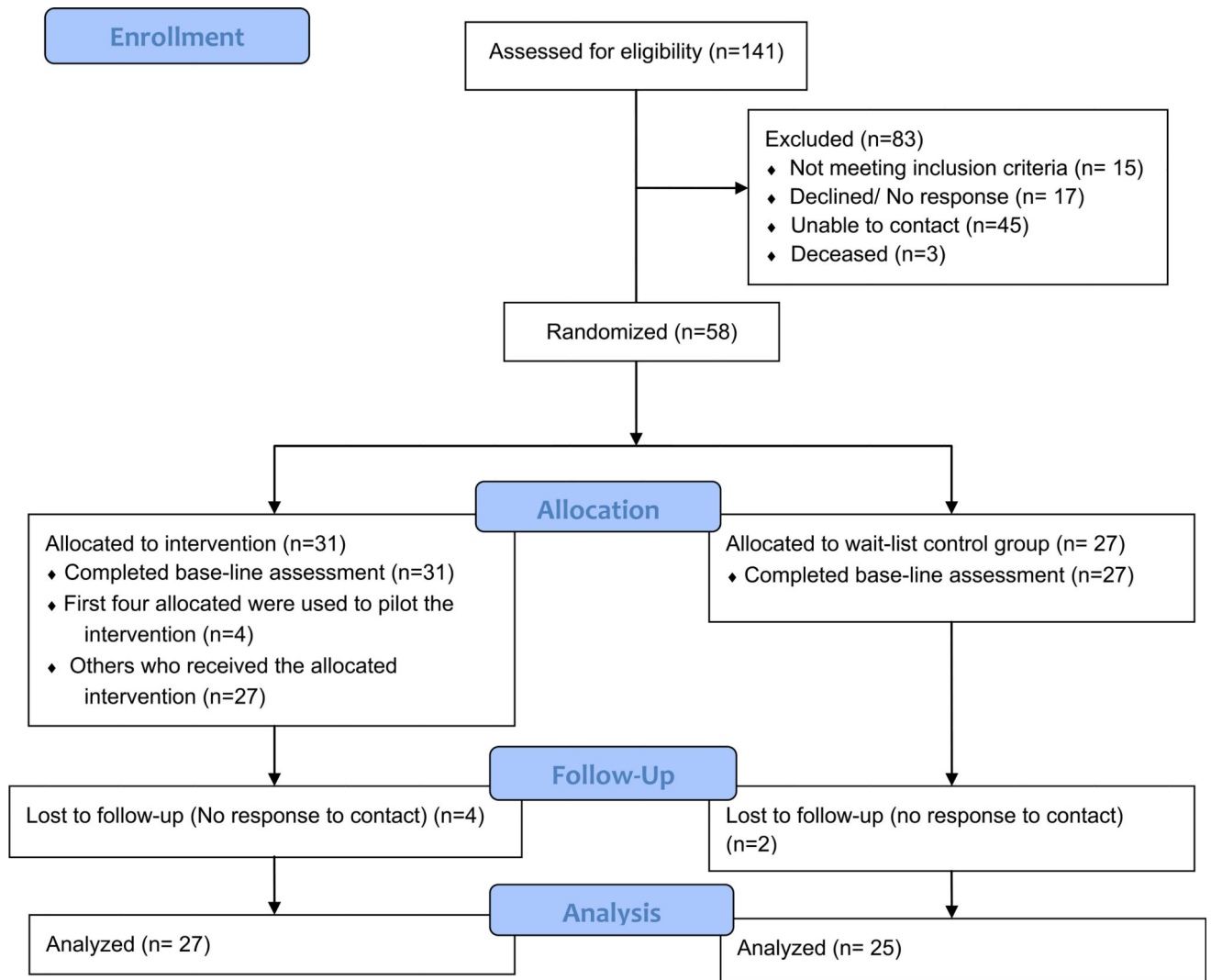
<b>CM-TBI</b>	Common Misconceptions about Traumatic Brain Injury Questionnaire
<b>GCS</b>	Glasgow Coma Scale
<b>TBI</b>	traumatic brain injury

## References

- Gouvier WD, Prestholdt PH, Warner MS. A survey of common misconceptions about head injury and recovery. *Arch Clin Neuropsychol.* 1988; 3:331–43. [PubMed: 14591423]
- Willer B, Johnson WE, Rempel RG, Linn R. A note concerning misconceptions of the general public about brain injury. *Arch Clin Neuropsychol.* 1993; 8:461–5. [PubMed: 14589715]
- Pickelsimer EE, Selassie AW, Sample PL, Heinemann AW, Gu JK, Veldheer LC. Unmet service needs of persons with traumatic brain injury. *J Head Trauma Rehabil.* 2007; 22:1–3. [PubMed: 17235226]
- Turner B, Fleming J, Cornwell P, et al. A qualitative study of the transition from hospital to home for individuals with acquired brain injury and their family caregivers. *Brain Inj.* 2007; 21:1119–30. [PubMed: 17952712]
- Turner BJ, Fleming J, Ownsworth T, Cornwell P. Perceived service and support needs during transition from hospital to home following acquired brain injury. *Disabil Rehabil.* 2011; 33:818–29. [PubMed: 20812814]
- Kreuter MW, McClure SM. The role of culture in health communication. *Annu Rev Public Health.* 2004; 25:439–55. [PubMed: 15015929]
- Lefebvre H, Pelchat D, Swaine B, Gelinas I, Levert MJ. The experiences of individuals with a traumatic brain injury, families, physicians and health professionals regarding care provided throughout the continuum. *Brain Inj.* 2005; 19:585–97. [PubMed: 16175812]
- O’Callaghan AM, McAllister L, Wilson L. Experiences of care: perspectives of carers of adults with traumatic brain injury. *Int J Speech Lang Pathol.* 2011; 13:218–26. [PubMed: 21563896]
- Hux K, Schram CD, Goeken T. Misconceptions about brain injury: a survey replication study. *Brain Inj.* 2006; 20:547–53. [PubMed: 16717000]
- Springer JA, Parmer JE, Bouman DE. Common Misconceptions about Traumatic Brain Injury among family members of rehabilitation patients. *J Head Trauma Rehabil.* 1997; 12:41–50.
- O’Jile JR, Ryan LM, Parks-Levy J, et al. Effects of head injury experience on head injury misconceptions. *Int J Rehabil Health.* 1997; 3:61–7.
- Englum BR, Villegas C, Bolorunduro O, et al. Racial, ethnic, and insurance status disparities in use of posthospitalization care after trauma. *J Am Coll Surg.* 2011; 213:699–708. [PubMed: 21958511]
- Bowman SM, Martin DP, Sharar SR, Zimmerman FJ. Racial disparities in outcomes of persons with moderate to severe traumatic brain injury. *Med Care.* 2007; 45:686–90. [PubMed: 17571018]
- Shafi S, de la Plata CM, Diaz-Arrastia R, et al. Ethnic disparities exist in trauma care. *J Trauma Acute Care Surg.* 2007; 63:1138–42.
- Chang PF, Ostir GV, Kuo YF, Granger CV, Ottenbacher KJ. Ethnic differences in discharge destination among older patients with traumatic brain injury. *Arch Phys Med Rehabil.* 2008; 89:231–6. [PubMed: 18226645]
- Pappadis MR, Sander AM, Struchen MA, Leung P, Smith DW. Common Misconceptions about Traumatic Brain Injury among ethnic minorities with TBI. *J Head Trauma Rehabil.* 2011; 26:301–11. [PubMed: 20808242]
- Larkey LK, Hecht ML, Miller K, Alatorre C. Hispanic cultural norms for health-seeking behaviors in the face of symptoms. *Health Educ Behav.* 2001; 28:65–80. [PubMed: 11213143]
- Zea MC, Quezada T, Belgrave FZ. Latino cultural values: their role in adjustment to disability. *J Soc Behav Pers.* 1994; 9:169.
- Anastasia EA, Bridges AJ. Understanding service utilization disparities and depression in Latinos: the role of fatalismo. *J Immigr Minor Health.* 2015; 17:1758–64. [PubMed: 25801450]

20. Goldstein LB, Silberberg M, McMiller Y, et al. Stroke knowledge in Spanish-speaking populations. *Neuroepidemiology*. 2015; 44:121–9. [PubMed: 25871697]
21. Castillo LG, Caver KA. Expanding the concept of acculturation in Mexican American rehabilitation psychology research and practice. *Rehabil Psychol*. 2009; 54:351. [PubMed: 19929116]
22. Swift TL, Wilson SL. Misconceptions about brain injury among the general public and non-expert health professionals: an exploratory study. *Brain Inj*. 2001; 15:149–65. [PubMed: 11260765]
23. Arango-Lasprilla JC, Ketchum JM, Williams K, et al. Racial differences in employment outcomes after traumatic brain injury. *Arch Phys Med Rehabil*. 2008; 89:988–95. [PubMed: 18452750]
24. Gary KW, Arango-Lasprilla JC, Ketchum JM, et al. Racial differences in employment outcome after traumatic brain injury at 1, 2, and 5 years postinjury. *Arch Phys Med Rehabil*. 2009; 90:1699–707. [PubMed: 19801059]
25. Rosenthal M, Dijkers M, Harrison-Felix C, et al. Impact of minority status on functional outcome and community integration following traumatic brain injury. *J Head Trauma Rehabil*. 1996; 11:40–57.
26. Sander AM, Pappadis MR, Davis LC, et al. Relationship of race/ethnicity and income to community integration following traumatic brain injury: investigation in a non-rehabilitation trauma sample. *NeuroRehabilitation*. 2009; 24:15–27. [PubMed: 19208954]
27. Sherer M, Nick TG, Sander AM, et al. Race and productivity outcome after traumatic brain injury: influence of confounding factors. *J Head Trauma Rehabil*. 2003; 18:408–24. [PubMed: 12973271]
28. Hart T, Whyte J, Polansky M, Kersey-Matusiak G, Fidler-Sheppard R. Community outcomes following traumatic brain injury: impact of race and preinjury status. *J Head Trauma Rehabil*. 2005; 20:158–72. [PubMed: 15803039]
29. Kreutzer JS, Serio CD, Bergquist S. Family needs after brain injury: a quantitative analysis. *J Head Trauma Rehabil*. 1994; 9:104–15.
30. Serio CD, Kreutzer JS, Gervasio AH. Predicting family needs after brain injury: implications for intervention. *J Head Trauma Rehabil*. 1995; 10:32–45.
31. Witol AD, Sander AM, Kreutzer JS. Alongitudinal analysis of family needs following traumatic brain injury. *NeuroRehabilitation*. 1996; 7:175–87. [PubMed: 24525887]
32. Rotondi AJ, Sinkule J, Balzer K, Harris J, Moldovan R. A qualitative needs assessment of persons who have experienced traumatic brain injury and their primary family caregivers. *J Head Trauma Rehabil*. 2007; 22:14–25. [PubMed: 17235227]
33. Holland D, Shigaki CL. SubjectReview: Educating families and caretakers of traumatically brain injured patients in the new health care environment: a three phase model and bibliography. *Brain Inj*. 1998; 12:993–1009. [PubMed: 9876860]
34. Urbaniak, GC., Plous, S. [Accessed January 15, 2008] Research randomizer. Available at: <http://www.randomizer.org>
35. Faul F, Erdfelder E, Lang AG, Buchner A. G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007; 39:175–91. [PubMed: 17695343]
36. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G\*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009; 41:1149–60. [PubMed: 19897823]
37. Williams DH, Levin HS, Eisenberg HM. Mild head injury classification. *Neurosurg*. 1990; 27:422–8.
38. Teasdale G, Jennett B, Murray L, Murray G. Glasgow Coma Scale: to sum or not to sum? *Lancet*. 1983; 322:678.
39. Guilmette TJ, Paglia MF. The public's misconceptions about traumatic brain injury: a follow up survey. *Arch Clin Neuropsychol*. 2004; 19:183–9. [PubMed: 15010084]
40. Bradford LS. Misconceptions about traumatic brain injury among US Army behavioral health professionals. *Rehabil Psychol*. 2015; 60:344. [PubMed: 26436992]
41. Ernst WJ, Trice AD, Gilbert JL, Potts H. Misconceptions about traumatic brain injury and recovery among nursing students. *J Head Trauma Rehabil*. 2009; 24:213–20. [PubMed: 19461368]

42. Farmer JE, Johnson-Gerard M. Misconceptions about traumatic brain injury among educators and rehabilitation staff: a comparative study. *Rehabil Psychol.* 1997; 42:273.
43. Bernal G, Bonilla J, Bellido C. Ecological validity and cultural sensitivity for outcome research: issues for the cultural adaptation and development of psychosocial treatments with Hispanics. *J Abnorm Child Psychol.* 1995; 23:67–82. [PubMed: 7759675]
44. U.S. Census Bureau. Washington (DC): U.S. Census Bureau, Population Division; Annual estimates of the resident population by sex, age, race, and Hispanic origin for the United States and States: January 1, 2015 to December 31, 2015. [Release Date: September 15, 2016]
45. Cohen, J. *Statistical power analysis for the behavioral sciences.* 2. Hillsdale: Erlbaum; 1988.
46. Díaz L. Cultural perceptions of traumatic brain injury and rehabilitation in minorities. *Sound Neurosci.* 2013; 1:10.
47. Agency for Healthcare Research and Quality. Rockville: Agency for Healthcare Research and Quality; Apr. 2016 2015 National Healthcare Quality and Disparities Report and 5th Anniversary Update on the National Quality Strategy. AHRQ Publication No. 16-0015
48. Sander, AM. Treating and collaborating with family caregivers in the rehabilitation of persons with traumatic brain injury. In: Sherer, M., Sander, AM., editors. *Handbook of the neuropsychology of traumatic brain injury.* New York: Springer; 2014. p. 271-82.



**Fig 1.** Flow diagram (CONSORT diagram) of study participants.

**Table 1**

Description of the topic areas of the TBI educational intervention

<b>Topic Area</b>	<b>Description</b>
1. What is head injury?	Participants learned about what is head injury and how does it occur.
2. What is TBI?	Description of TBI was discussed.
3. How does injury to the brain occur?	Two types of TBI (ie, open and closed) were discussed and how they occur. Detailed discussions of the various ways a brain may be injured were provided.
4. How serious was my injury?	Participants were educated about how medical professionals determine the severity of TBI. Information about loss of consciousness, posttraumatic amnesia, retrograde amnesia, and the GCS was provided. Brief descriptions of mild vs moderate to severe TBI were provided.
5. What problems may I have after TBI? And what can I do?	This area included discussions of the physical, cognitive, and emotional/personality problems common after TBI. In addition, strategies to cope with each of the common problems were provided.
6. How long will my symptoms last?	Tips for helping with recovery and coping strategies from a TBI survivor were discussed.
7. When should I seek medical help?	Discussion of the warning signs to look for to decide whether medical care should be sought.
8. Common misconceptions	Addressed common misconceptions about TBI, its symptoms, and the recovery process.
9. Where can I go to get help?	Provided resources available in the area and how to seek medical or financial assistance.
10. Extra information	Provided stress management techniques and other cognitive-behavioral approaches to help in coping with TBI.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 2**

## Baseline demographic characteristics

Characteristic	Total (N = 52)	Wait-List Control (n = 25)	Intervention (n = 27)	P
Race				
Black	25 (48.1)	13 (52.0)	12 (44.4)	.79
Hispanic/Latino	27 (51.9)	12 (48.0)	15 (55.6)	
Age (y)	37.71±13.88 (19–66)	36.08±13.78 (19–60)	39.22±14.05 (20–66)	.42
Sex				
Female	14 (26.9)	7 (28.0)	7 (25.9)	>.99
Education				
Less than high school	21 (40.4)	10 (40.0)	11 (40.7)	.68
High school	17 (32.7)	7 (28.0)	10 (37.0)	
College	14 (26.9)	8 (32.0)	6 (22.2)	
Primary language *				
English	40 (76.9)	20 (80.0)	20 (74.1)	.86
Spanish	12 (23.1)	5 (20.0)	7 (25.9)	
U.S. born				
Yes	33 (63.5)	15 (60.0)	18 (67.7)	.83
Practicing a religion				
Yes	30 (57.7)	15 (60.0)	15 (55.6)	.97
Income				
\$20,000	32 (65.3)	17 (70.8)	15 (60.0)	.62
>\$20,000	17 (34.7)	7 (29.2)	10 (40.0)	
Best 24-hour GCS score	11.27±3.89 (3–15)	11.72±3.76 (3–15)	10.85±4.04 (3–15)	.43
Complicated mild TBI	26 (50.0)	13 (52.0)	13 (48.1)	.50
Moderate to severe TBI	26 (50.0)	12 (48.0)	14 (51.9)	
Months postinjury	24.69±11.50 (6–47)	23.12±11.30 (8–47)	26.15±11.70 (6–47)	.35
Mechanism of injury				
MVC/MCC	20 (38.5)	9 (36.0)	11 (40.7)	NT
Auto-pedestrian	6 (11.5)	3 (12.0)	3 (11.1)	
Fall/jump	10 (19.2)	5 (20.0)	5 (18.5)	
Assault	10 (19.2)	4 (16.0)	6 (22.2)	
GSW	5 (9.6)	4 (16.0)	1 (3.7)	
Hit by object	1 (1.9)	0 (0.0)	1 (3.7)	

NOTE. Values are mean ± SD (minimum-maximum) or n (%).

Abbreviations: GSW, gunshot wound; MCC, motor cycle collision; MVC, motor vehicle collision; NT, not tested.

\* Assessments and the intervention were provided in the primary language of the participants.

**Table 3**

Means and SDs for the total percentage of misconceptions on the CM-TBI for the intervention group stratified by injury severity and language (n = 27)

<b>Variable</b>	<b>Time 1: Baseline Assessment</b>	<b>Time 2: Post- intervention</b>	<b>Time 3: 1-Mo Follow-Up</b>
Total	30.37±9.06	25.19±11.68	26.76±11.74
Mild TBI	30.19±8.13	26.35±10.45	27.12±9.29
Moderate to severe TBI	30.54±10.15	24.11±13.03	26.42±14.00
English	27.25±7.47	23.13±10.16	24.13±11.36
Spanish	39.29±7.32	31.07±14.50	34.29±9.97

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript