

## Special Article – Brain Injury Rehabilitation

# Race and Post-acute Stroke Recovery: More Similarities than Differences

Perna R\*, Wiegand L, Pundlik J, Block C and Caroselli J

TIRR Memorial Hermann at Kirby Glenn, 2455 South Braeswood Boulevard Houston, TX 77030, USA

\*Corresponding author: Robert Perna, TIRR Memorial Hermann at Kirby Glenn, 2455 South Braeswood Boulevard Houston, TX 77030, USA

Received: September 28, 2017; Accepted: October 23, 2017; Published: October 30, 2017

## Abstract

Race is a significant variable in terms of some health outcomes. Research has produced mixed findings in regards to the influence of race membership and rehabilitation outcomes from cardiovascular insults. More extensive research focused on traumatic brain injury (TBI) has found significant racial differences in post-injury recovery outcome. Stroke rehabilitation research has noted similar findings. However, such differences in functional outcomes were largely predicted by demographic characteristics such as age, education, and socioeconomic status, as well as injury and environmental parameters. The current archival study compared rehabilitation outcomes across two demographically comparable racial/ethnic groups (i.e., Whites of non-Hispanic origin, and Blacks) with a hypothesis that in a sample that does not widely vary in key demographic confounds (age, education, premorbid job status, substance use), there may still be significant racial differences in rehabilitation outcomes. The participants included 317 individuals (White = 224, Black = 93) who had suffered a cerebrovascular incident (CVA) within three months prior to initiating rehabilitation at an urban outpatient multidisciplinary brain injury rehabilitation program. The two racial groups were comparable in terms of mean age (46.3 vs. 48.3), education level (14.4 vs. 15.4), premorbid employment (76.9% vs. 74.2%), and substance use (19% vs. 21.9%), as well as disability severity as measured by admission Mayo Portland Adaptability Inventory (44.6 vs. 45.9). Admission MPAI-4 scores revealed that both groups began treatment with mild limitations in the areas of ability and adjustment as well as mild to moderate interference with community participation. Comparative data via ANOVA indicated that although both groups appeared to have significantly benefitted from rehabilitation, there were no statistically significant differences in the discharge MPAI scores between the two groups. The two groups also did not significantly differ with regard to the MPAI change scores (admission minus discharge). Results suggest that early (within six months post CVA) rehabilitation outcomes measured by MPAI-4 are far more similar than different for these two racial groups, when the groups are comparable on key demographic variables. These findings are consistent with previous research on the topic. Limitations of this study include higher than average educational level of participants, limited outcome measures, and limited racial representation.

**Keywords:** Race; Stroke; Outcome; Rehabilitation; MPAI; Matched Demographics

## Introduction

Stroke is the leading cause of long-term disability and fourth leading cause of death in the US American Heart Association, 2014. The post-stroke disability is often related to a broad array of potential physical, cognitive, behavioral, and emotional sequelae that pose significant challenges to resume former life roles and activities [1,2]. Although the functional challenges and disabilities vary by stroke etiology, severity, and location, a wide range of activity limitations have been reported in both the home environment and community in the first-incident stroke survivors at six months post injury. Over 50% of community-dwelling first-incident stroke survivors, unless assisted by an at-home caregiver, require some form of assistance in activities of daily living and community integration and many report lack of meaningful endeavors [3].

## Racial Differences in Rehabilitation Outcome

Neurorehabilitation therefore assumes an important role in a stroke survivor's journey back to functional independence, as it bears a positive impact on the general level and trajectory of recovery. In the growing body of rehabilitation research, one significant area of interest has been the potential contribution of one's racial/ethnic membership to stroke outcomes [4,5]. A number of studies have supported significant differences in rehabilitation outcomes as a function of racial/ethnic membership even after adjusting for stroke severity, other prognostic variables (e.g., age, income, education level, etc.), and hospital characteristics (e.g., hours per day receiving treatment, number of caregivers, etc.). Most studies compared functional status of racially diverse groups at admission and discharge using measures such as the Functional Independence Measure (FIM),

**Table 1:** Demographic and Admission Information by Racial Group.

	Racial/Ethnic Group Data in Averages	
	Black (n=224)	White (n=93)
Age	46.3	48.3
Education	14.4	15.4
Married	55.7%	75%
Living with spouse or children	60%	74.3%
Ischemic/Hemorrhagic	51%	48%
Mpai-4 Admission Total Score	44.6 (18.8)	45.9 (16.0)
Competitively employed at time of/before stroke	76.9%	74.2%
No substance abuse	81%	78.1%

in which higher scores indicate greater functional independence [6]. In a study, Bhandari et al., observed that Black individuals achieved marginally lower initial functional gains, described as the difference between admission and discharge scores [5]. However, this difference appeared to disappear by 3-months post injury in another study [4]. In direct contrast, Berges et al. noted significant differences at 3 months post injury while finding no significant differences at discharge [7]. When examining change over time, another study observed that whites demonstrated greater overall gains in FIM total and cognitive scores from admission to discharge [8], although once admission FIM scores were statistically accounted for, these significant racial/ethnic differences in post-acute rehabilitation outcomes were eliminated [9-12].

In addition to directional changes in FIM scores, researchers have used comparison of basic and independent activities of daily living performance (e.g. feeding, bathing, grooming, mobility, etc.) as a way to measure post-CVA functional recovery in racial/ethnic minorities. Results have documented consistent racial/ethnic differences, such as slower recovery rate and lower ADL/IADLs at 1 year post injury in Black patients relative to Whites [13], as well as reduced likelihood for employment, lower levels of functional independence, and lower levels of driving independence in ethnic minorities and poorer treatment outcomes even after controlling for injury severity and rehabilitation utilization [4].

Some research on stroke suggests racial/ethnic differences in stroke outcomes are a proxy for patient/caregiver characteristics and other pre-existing factors such as premorbid medical risk factors, socioeconomic status, quality of education, quality of care, access to care, transportation, locus of control, social support, and even immigration status [14]. Younger age, lower educational and financial status and higher metabolic and cerebrovascular comorbidities in Black and Hispanic patients have also been noted as factors influencing outcomes in some ethnic minority groups. These complexities warrant further investigation to examine potential impact of one's racial/ethnic membership on post-acute stroke rehabilitation outcomes.

## The Current Study

The current study examined the archival data to explore the relationship between race and stroke rehabilitation outcome in two racial/ethnic groups: White/Whites and Black/Blacks. The two

racial/ethnic groups did not significantly differ on key demographic characteristics such as, age, education, or premorbid employment status, as well as with regard to other factors such as post-injury interval or rehabilitation stay. The MPAI-4 was used to assess the functional status at admission, as well as at discharge. This allowed for a consistent change score, as determined by subtracting the MPAI-4 admission score from the MPAI-4 discharge score, which helped measure each individual's response to rehabilitation or rehabilitation outcome.

Given that the weight of evidence appears to suggest that there may be some racial group differences in stroke outcomes, it was hypothesized that there will be significant between-group differences in rehabilitation outcomes, as measured by changes in MPAI-4 admission and discharge scores. A study of this nature could be a step forward in the rehabilitation literature, facilitating further insight into the potential role of race in functional outcome.

## Methods

### Participants

This is an archival study which utilized clinical outcomes data from a post-acute brain injury rehabilitation program. Data was extrapolated for 317 program participants (N = 317), divided into two groups based on racial/ethnic membership (White n =224, 70.66%; Black n =93, 29.33%). Statistical comparison of demographic characteristics indicated that these two groups were equivalent in age (48.3 vs. 46.3) and level of education (15.4 vs. 14.4), and exhibited similar initial adaptive symptom severity as measured by the MPAI-4.

The participants included in the analysis were survivors of a first-time ischemic or hemorrhagic stroke, who were enrolled in the outpatient post-acute rehabilitation program within the first 3 months post stroke. All were provided similar standard rehabilitative care, which combined physical, occupational, speech, and neuropsychological therapies for a minimum of 3 or more hours per day, three days each week, for approximately 10-12 weeks.

### Instruments

In the current study, functional outcomes were measured with the Mayo-Portland Adaptability Inventory-IV (MPAI-4; 2005). This is a consensus based functional disability rating scale which measures functional status across three major domains or subscales, including: Ability (basic and complex cognitive functions: motor, audition, speech, memory, knowledge, problem-solving), Adjustment (psychosocial/emotional functioning: anxiety, depression, fatigue, self-awareness, initiation, recreational activities), and Participation (complex social engagement: social contact, self-care, residence, transportation, work/school, money management). The MPAI-4 has 35 items in total. The first 29 items are subsumed within the three subscales whereas the additional 6 items are not included in the MPAI-4 score. The three subscales produce a significant range of disability scores: Ability Index (range 0-47); Adjustment Index (range 0-46); Participation Index (range 0-30), and overall Total score (range 0-111). On the MPAI-4, lower scores indicate greater adaptive functioning and integration.

Benefits of the MPAI-4 include that ratings are completed by clinical providers as well as the program participants and caregiver(s).

**Table 2:** Racial Group Comparison scores across MPAI-4 Subscales at Admission, Discharge, and Change scores.

MPAI-4 subscales and other outcomes	Admission MPAI-4 Racial Group means Black/White	Discharge MPAI-4; Racial Group means Black/White	MPAI-4 Racial group change score
Abilities (12 items)	16.8/17.2 ns.	8.3/8.9 ns.	8.3/8.2 ns.
Adjustment (9 items)	10.3/11.3 ns.	5.8/6.1 ns.	4.3/5.1 ns.
Participation (8 items)	17.5/18.1 ns.	10.3/10.4 ns.	7.0/7.6 ns.
Total	44.6/45.9 ns.	24.6/24.6 ns.	19.8/21.6 ns.
Productivity (Working at the time)	6.8%/11.9%	23.6/36.1	

This combination of objective and subjective data results in a more comprehensive assessment of the patient's impairments and progress pertinent to rehabilitation process. Additionally, the MPAI-4 has a large normative sample (861 adults in rehabilitation programs across 7 geographically distinct US cities) against which providers can reliably compare the individual.

### Procedures

On admission and at the time of discharge, the MPAI-4 was completed by the treating clinicians of each program participant. To measure treatment effects/gains, a MPAI-4 total change score was computed for each index by subtracting the MPAI-4 admission score from the MPAI-4 discharge score. Using analysis of variance, the two racial groups were compared on admission, discharge, change scores for the three MPAI-4 indexes and additionally, with respect to their overall Productivity, as determined by the ability to resume work, school, or home-making. (Consistent with the program's community reintegration focus, the groups were also compared with regard to work status, labeled as Productivity).

### Results

One way analysis of variance comparing racial groups found no significant MPAI-4 differences at time of admission [Abilities  $F(1,139) = 0.10, p > .05$ , Adjustment  $F(1,140) = 1.21, p > .05$ , Participation  $F(1,141) = 0.33, p > .05$ , MPAI Total  $F(1,142) = 0.20, p > .05$ , Productivity  $F(1,141) = 1.42, p > .05$ ].

One way analysis of variance comparing racial groups found no significant MPAI-4 differences at time of discharge [Abilities  $F(1,139) = 0.10, p > .05$ , Adjustment  $F(1,140) = 1.21, p > .05$ , Participation  $F(1,141) = 0.33, p > .05$ , MPAI Total  $F(1,142) = 0.20, p > .05$ , Productivity  $F(1,141) = 1.42, p > .05$ ].

Racial comparison of MPAI-4 difference scores also showed no significant difference [Abilities  $F(1,139) = 0.28, p > .05$ , Adjustment  $F(1,140) = 1.26, p > .05$ , Participation  $F(1,141) = 0.32, p > .05$ , MPAI Total  $F(1,142) = 0.55, p > .05$ , Productivity  $F(1,141) = 1.26, p > .05$ ]. Chi square analysis showed no significant difference in productivity.

### Discussion

An overarching goal of this study was to help clarify any potential racial/ethnic differences in post-acute stroke functional outcomes.

Findings show that individuals from both ethnicities (Black and White) with stroke showed significant functional gains, as measured by the MPAI-4 at the conclusion of post-acute rehabilitation. In fact, both groups demonstrated very similar improvements across all three MPAI-4 scales (Abilities, Adjustment, Participation), which reflects

a similar pattern of recovery at this stage in recovery. These scores indicate that regardless of their race/ethnicity, all Black and White program participants included in the analysis show similar treatment outcomes at this stage of recovery and that the stroke symptoms at discharge were on average interfering with functional activities to a significantly lesser degree at discharge than at the beginning of the rehabilitation/treatment. In this study we chose to include a measure of productivity (return to work/school/home making) to help explain overall outcomes from a community reintegration perspective. Our data shows both racial groups had a very low productivity at admission to post-acute treatment and a significantly improved level of productivity at discharge. For Blacks the change was from 6.8% to 23.6% and for Whites it was from 11.9% to 36%. Whites were more likely to be employed at time of admission and discharge, but both groups had significantly higher levels of employment at time of discharge.

Results suggest that there are far more similarities than differences between these the two racial groups when measuring post-acute rehabilitation functional outcomes in the six months following injury. While most research in the area has involved racial groups with significantly different demographics, the two racial groups in the current study were demographically similar, which minimized the confounding effects and eliminated the need for covariate analysis/management. The results nevertheless remain consistent and continue to highlight similar brain injury rehabilitation outcomes across racial/ethnic groups.

### Limitations and Future Directions

The analyses in this study were limited only to two ethnic groups and therefore cannot be applicable to other ethnic minorities. The generalizability may also be limited by sample group specificity. Further, the present study could not address the question about the influence of numerous other cultural, environmental factors as outlined in Arango-Lasprilla et al. [14]. Treatment outcomes may also be tracked further along the spectrum of post-acute recovery to examine if the recovery trajectory remains the same or changes over time.

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