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Positive Emotion following a Stroke

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Abstract

OBJECTIVES—As populations age, interest in exploring the emotional health of adults has increased. In the current study we were interested in investigating the positive emotion of adults with stroke at discharge from in-patient medical rehabilitation and 3 months post discharge.

DESIGN—A longitudinal study using information from the Stroke Recovery in Underserved Patients database.

SETTING—Information was collected during in-patient medical rehabilitation stay and approximately 3 months post discharge.

PARTICIPANTS—The study included 856 persons aged 55 or older with stroke admitted to in-patient medical rehabilitation in the U.S.

MEASUREMENTS—Positive emotion.

RESULTS—The average age was 72.5 years, 78.7% were non-Hispanic white and 51.9% were women. The average length of in-patient hospital stay was 20.2 (SD 10.1) days. More than a third (35.6%) reported higher positive emotion over the 3 month follow-up, while 29.7% reported lower positive emotion. In addition to discharge positive emotion, three factors including depression (b = −0.05, SE .02, p = .0001), level of education (b = 0.08, SE .04, p = .04) and functional status (b = 0.04, SE .006, p = .001) significantly predicted higher positive emotion at 3 month follow-up.

CONCLUSION—A large percentage of adults report high positive emotion in the initial months following a stroke. This finding adds to work on stroke recovery and indicates the resilience of adults when faced with a health challenge. Understanding the role of positive emotion in persons living with stroke may provide critical insight into long-term recovery.

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Author Contributions

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M. Ottenbacher - Contributed to concept and design, drafted and revised introduction and discussion sections, and approved final version.

K. Ottenbacher - Contributed to concept and design, conducted analysis and interpretation of data, revised manuscript, and approved final version.

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Keywords

Positive affect; ethnic groups; cerebrovascular accident; recovery of function

INTRODUCTION

Compelling evidence points to the importance of positive emotion in the face of a health challenge.[1-4] Individual reports of positive emotion have been reported under the most difficult and stressful of circumstances and may, in part, be necessary for recovery and survival.[5-13]. In a 15 year prospective study of women with breast cancer (stage I and II), Greer et al[14], found those with a fighting spirit reported the best outcomes compared with those who viewed the situation as hopeless. Among patients with hip fracture, those who reported good emotional health were three times more likely than depressed patients to achieve independence in walking, nine times more likely to return to prefracture levels of physical functioning, and nine times more likely to reach the highest quartile of overall physical function.[15] HIV patients with high positive emotion have demonstrated slower immune decline, later symptom onset, and longer survival times.[16,17] Fredrickson & Levenson[18] have also shown positive emotion to reduce reports of depression following a stressful event.

A goal of the current investigation was to assess the positive emotion of adults aged 55 or older following a stroke at two time points including discharge from in-patient medical rehabilitation and approximately 3 months later. Annually, an estimated 10 million individuals worldwide survive a stroke,[19] yet little is known about the positive emotional experiences of these individuals. A second goal of the investigation was to explore demographic characteristics and measures of health status associated with positive emotion. An association between these factors and positive emotion would add to studies of recovery and resilience and may open new directions for clinical and rehabilitation care delivery and research. Such new directions are of importance for stroke survivors who hope to reacquire functional abilities and independence.

METHODS

Source of Data

Data came from the Stroke Recovery in Undeserved Populations (SRUP) database, an ongoing observational follow-up study of persons with stroke who received in-patient medical rehabilitation services in 2005−2006. A total of 20 facilities were invited to participate and were sent information describing the goals of the study. Of these, 16 agreed to participate in the study. Five facilities located in the Gulf coast region and affected by hurricanes (2005) were subsequently removed from the study. The 11 remaining facilities were located across diverse regions of the country including: California, Florida, Iowa, Illinois, Kentucky, New Jersey, New York (2), Texas (2), and Washington DC. Operating bed sizes ranged from 12 to 155 (median bed size = 78); all eleven facilities were accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO); and all but one facility was accredited by the Commission on Accreditation of Rehabilitation Facilities (CARF).

Data Collection

Sociodemographic characteristics and clinical measures of health status were collected at 2 time points: within 72 hours of discharge from in-patient medical rehabilitation facility, and approximately 3 months post discharge (Mean 93 days, SD 20.7). In-hospital interviews were by nursing staff at the in-patient medical rehabilitation facility. Follow-up information was collected by trained nurse researchers by telephone interview. The interrater reliability and

stability of the follow-up information collected using phone interviews has been established, with ICC values for functional assessments ranging from 0.86 to 0.99.[20,21] In-hospital and follow-up interviews were conducted in Spanish or English.

Study Population

Individuals eligible for inclusion into the SRUP study had to be admitted to an in-patient medical rehabilitation facility with a diagnosis of stroke (ICD-9 codes 436−439) and aged 55 years or older of either gender. Patients were screened for cognitive appropriateness by nursing staff at the rehabilitation facility, on their ability to respond to basic questions about orientation to person, place, and time. A total of 1,006, non-proxy and cognitively appropriate patients (798 non-Hispanic whites, 150 African Americans, and 58 Hispanics) were interviewed within 72 hours of discharge from in-patient medical rehabilitation facility.

The current study included 856 patients with stroke who had complete information on positive emotion at discharge and 3 month follow-up interview. Of the original 1006 patients, 29 died, 42 refused follow-up interview, and 28 could not be contacted. An additional 51 patients were removed from the analysis because of missing sociodemographic and health-related measures. To evaluate the potential bias of those lost to follow-up, we tested for significant differences across various sociodemographic and health-related measures. After reviewing these measures we did not identify any potential confounders with known or suspected associations with positive emotion. Central and local ethical committee approval was sought and obtained. Consent was obtained in-person at the time of the discharge interview.

Outcome Measure

Positive emotion—A four-item positive emotion summary score was created from a 20-item Center for Epidemiologic Studies - Depression (CES-D) scale.[22-25] The four positive items included: “I felt that I was just as good as other people”, “I felt hopeful about the future”, “I was happy”, and “I enjoyed life”[23]. Responses were scored on a four-point scale (0 to 3) and ranged from 0 (rarely or none of the time) to 3 (most of the time). Summing the responses from the 4-items created a positive emotion summary score at two time points including discharge and 3 month follow-up. A positive emotion change score was computed as the difference between 3 month follow-up and discharge, where higher scores indicate higher positive emotion. The four positive emotion items have shown high internal consistency (alpha = .80), and a weak correlation (r = −.26) with the 16 negative items on the CES-D.[26]

Covariates

Sociodemographic and health-related measures were included as covariates in the statistical models described below. Sociodemographic measures included age (≥ 55), gender, marital status, (married vs. unmarried), ethnicity (non-Hispanic white, non-Hispanic black and Hispanic) and years of schooling completed.

Health-related measures included comorbidities (heart attack, diabetes, arthritis, kidney disease and cancer), depressive symptoms, length of hospital stay, stroke type (ischemic, hemorrhagic or other), body involvement (right or left, bilateral or no paresis) and functional status. Depressive symptoms were calculated by summing the 16 remaining items from the CES-D scale (range of 0 to 48), where higher scores indicated higher depressive symptoms. Length of stay was calculated in days from in-patient admission to discharge. Functional status was assessed by the Inpatient Rehabilitation Facilities-Patient Assessment Instrument (IRF-PAI). The IRF-PAI is a 54-item instrument used to assign medical rehabilitation inpatients to a case-mix group. The case-mix group determines prospective reimbursement for medical rehabilitation by the CMS.[27-29] The functional status items in the IRF-PAI are from the Functional Independence Measure (FIM), a standardized measure including 18 items covering

six domains: self-care, sphincter control, transfer, locomotion, communication, and social cognition. All 18 items are scored into one of seven levels of function, ranging from complete dependence (level 1) to complete independence (level 7). Total FIM ratings have a potential range of 18 to 126, where higher scores indicate greater functional independence. The reliability, validity, and responsiveness of the FIM instrument have been widely investigated.[30-32] The reliability (intraclass correlation coefficient) of the total FIM and of its domains has consistently been found to be >0.85.[30,31].

Statistical analysis

Descriptive statistics were reported as means (and standard deviations) for continuous measures and as percentages for categorical measures. To compare associations for discharge sociodemographic and health-related measures on follow-up positive emotion, three generalized linear regression models were computed. The first model included sociodemographic measures (age, sex, marital status, and years of education) as predictor variables. The second model added health-related measures (type of stroke, main area of body involvement, total FIM score, length of hospital stay (LOS), comorbidities and depressive symptoms). The third model added total FIM change score from discharge to 3 month follow-up.

A fourth model examined positive emotion change score (from discharge to 3 month follow-up) and included discharge sociodemographic and health-related measures described above. For all models, testing was 2-sided using an alpha of .05. Model assumptions for the four regression models were tested and met. All analyses were performed using SAS software, version 9.3 (SAS Institute, Cary, NC).

RESULTS

A total of 856 patients with complete information at discharge and 3 month follow-up interview were included in the study. The most prevalent type of stroke was ischemic (75.2%), followed by hemorrhagic (15.3%) and other stroke (9.5%). A high percentage of patients had left (42.2%) or right body involvement (39.6%). A small percentage had bilateral body involvement (3.3%) and 14.9% had no paresis. Most patients were admitted from home (97.3%) and discharged to home (74.8%). Of those not discharged directly to home (n = 195), the majority (91.2%) were placed in a skilled nursing facility, an acute unit at another facility or in a subacute setting. The average length of hospital stay was 20.2 (SD 10.1) days and did not significantly differ by age, gender or ethnicity.

Table 1 shows sociodemographic and health related characteristics of the sample at discharge from in-patient medical rehabilitation facility. A majority of the patients were women (51.9%), non-Hispanic white (78.7%) and aged 55 − 74 (52.8%). Most had a high school education or more (78.5%) and fewer than half were currently married (47.8%). Most had 1 or more comorbidities (76.2%) and about a third reported high depressive symptoms (32.5%). The average total FIM score was 79.3 (SD 24.2).

For the overall sample, mean positive emotion scores were similar at discharge (mean = 9.1, SD 3.2) and at 3 month follow-up (mean = 9.5, SD 3.1) interview. No significant differences on positive emotion score were found for gender, age and ethnic group, or type of stroke. Patients with no paresis reported the highest mean positive emotion score (mean = 10.4, SD 2.5), and those with bilateral involvement reported the lowest mean positive emotion score (mean = 8.6, SD 3.5). The Figure shows positive emotion change scores from discharge to 3 month follow-up for the overall sample. Approximately one-third of patients (34.7%) reported no change in their positive emotion score, with 35.6% reporting higher scores and 29.7%

reporting lower scores over the 3 month follow-up. Of those who reported no change (n = 297), 79.1% recorded the highest positive emotion score of 12 at discharge and 3 month follow-up.

To examine the independent association between discharge sociodemographic and health-related measures on follow-up positive emotion three generalized linear regression models were tested (Table 2). For each model unstandardized parameter estimates (b) and standard error (SE) were presented, $p < 0.05$ was considered significant. Model 1 included sociodemographic measures and showed that higher level of education (b = 0.10, SE .03) and discharge positive emotion (b = 0.45, SE .03) were significantly associated with higher positive emotion at follow-up. In Model 2, health-related measures were added to the analysis. Significant health-related measures of follow-up positive emotion included total FIM score (b = 0.02, SE .0001) and depressive symptoms (b = −0.07, SE .01). Higher education (b = 0.08, SE .008) and discharge positive emotion (b = 0.29, SE .04) also remained significant predictors of follow-up positive emotion. Length of hospital stay, type of stroke, body involvement and number of comorbidities were not significantly associated with follow-up positive emotion. In Model 3, total FIM change score was added to sociodemographic and health-related measures. The findings showed that higher total FIM change score (b = 0.04, SE .008) was significantly associated with higher follow-up positive emotion.

In a fourth regression model, associations between sociodemographic and health-related measures and positive emotion change score were tested. The findings showed higher education (b = 0.08, SE .04), depressive symptoms (b = −0.05, SE .02), discharge total FIM score (b = 0.04, SE .01), total FIM change score (b = 0.04, SE .01) and discharge positive emotion (b = 0.70, SE .05) were significantly associated with higher positive emotion change score.

DISCUSSION

The current study examined the positive emotional health of patients following stroke, a previously unexplored area of research. Overall, we found patients can experience positive emotion in the initial months following their stroke event and that level of positive emotion does not significantly differ by age, gender or ethnicity. We further observed that positive emotion is a dynamic process. More than one-third of our sample reported higher positive emotion change scores between discharge and 3 month follow-up interview, just under one-third reported lower change scores and about one-third reported no change. Of those who reported no change, 79.1% recorded the highest positive emotion score of 12 at both discharge and follow-up interview. This suggests a ceiling effect, and may underestimate the actual percentage of those with higher positive emotion change score.

We further showed three discharge measures, depressive symptoms, education, and functional status were significantly linked to positive emotion at follow-up and to change in positive emotion. It should be noted that discharge positive emotion was also significantly associated with follow-up positive emotion, independent of depression, so was not simply the opposite or absence of this negative measure. This finding adds further support to the independence hypothesis between positive and negative emotions.[4,9,26,33,34]

Assessing the role of positive emotion in the onset, progression and treatment of disease has gained in importance during the last decade. In epidemiologic studies, high positive emotion has been significantly associated with a reduced risk of new onset disease, disability and mobility limitations in adults.[26] Clinical data also have shown a link between positive emotion and biological markers. In a sample of middle-aged adults, Steptoe et al[4] demonstrated an association between higher positive emotion and lower neuroendocrine, inflammatory and cardiovascular activity. Epel et al[35] showed individuals who were able to find positive meaning

after a traumatic event had more adaptive hormonal responses to subsequent stressors. Although exact mechanisms are not well-known at this point, these studies indicate that positive emotion may play an important role in keeping the body in balance via chemical and neural responses,[1,36,37] which may be of added importance among the less healthy.

A number of researchers have hypothesized that, under stressful conditions, when negative emotions such as depression dominate, positive emotions may provide relief and help support coping efforts.[5,8,38,39] Although not formally tested in the current study this idea has potential implications in stroke recovery programs and warrants investigation. That is, understanding the role of positive emotion in limiting the negative effects of depression, for example, may subsequently result in a better understanding of how patients with stroke cope and adapt. The Commission on Accreditation of Rehabilitation Facilities (CARF)[40] suggests programs that can demonstrate improved emotional health for their patients after discharge will have a clear advantage in the healthcare marketplace.

As previously mentioned, we identified two key measures, functional status and education, in addition to depression, that influence positive emotion. Functional status is an important indicator of recovery and provides clinicians with an objective means to track patient progress during hospital stay and post discharge. In persons with stroke, Granger and colleagues,[41] observed an inverse gradient of association where each 1-point increase in functional ability score decreased the need of assistance by another person to complete basic activities of daily living by about 2.2 minutes. In persons recovering from an acute medical event, it is likely that functional ability and positive emotion act as a positive feedback loop, where an increase in one measure likely contributes to an increase in the other.[42]

The link between education, a component of socioeconomic status, and positive emotion is less clear but may be mediated by greater psychosocial resources which includes better coping styles, personal control and greater social support.[43-45] Using data from three national samples, Lachman and Weaver[46] found significant interactions between personal control and education in relation to health and well-being. A challenge for researchers is not only to control for SES variables in statistical models but to combine them in meaningful ways with clinically relevant data, to potentially identify at risk individuals. In the current study we included one component of SES, education, however, other unmeasured components at the individual (income, wealth, occupation) and neighborhood level need to be examined, as these may have different meanings in different social groups (e.g., ethnicity or gender) which may affect conclusions drawn.

Our analysis has some limitations. First, as in all longitudinal studies, biases might have been introduced by missing data or unbalanced representation of the population. Second, although our data was collected across diverse geographic regions in the U.S., the study participants were not randomly selected and may not be representative of all persons with stroke. Third, because there exists interhospital variability in the type and quality of care delivered by in-patient medical rehabilitation facilities in the U.S. selected facilities in this study may not adequately reflect the rehabilitation experience at other facilities. Nevertheless, the study did include JACHO and CARF accredited facilities, which set guidelines and standards for rehabilitation facilities. Strengths of the investigation include the large representative sample of persons with stroke and diagnosis of stroke using CMS codes.

In summary, good long-term recovery for persons with stroke requires a healthy mind and body. The importance of collecting information on positive emotion is that it not only assesses what the patient feels about their current health status, but it may also predict whether these individuals seek on-going treatment or therapy, or perhaps more importantly, whether they consider themselves to be successfully coping with their medical event.

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Conflict of interest

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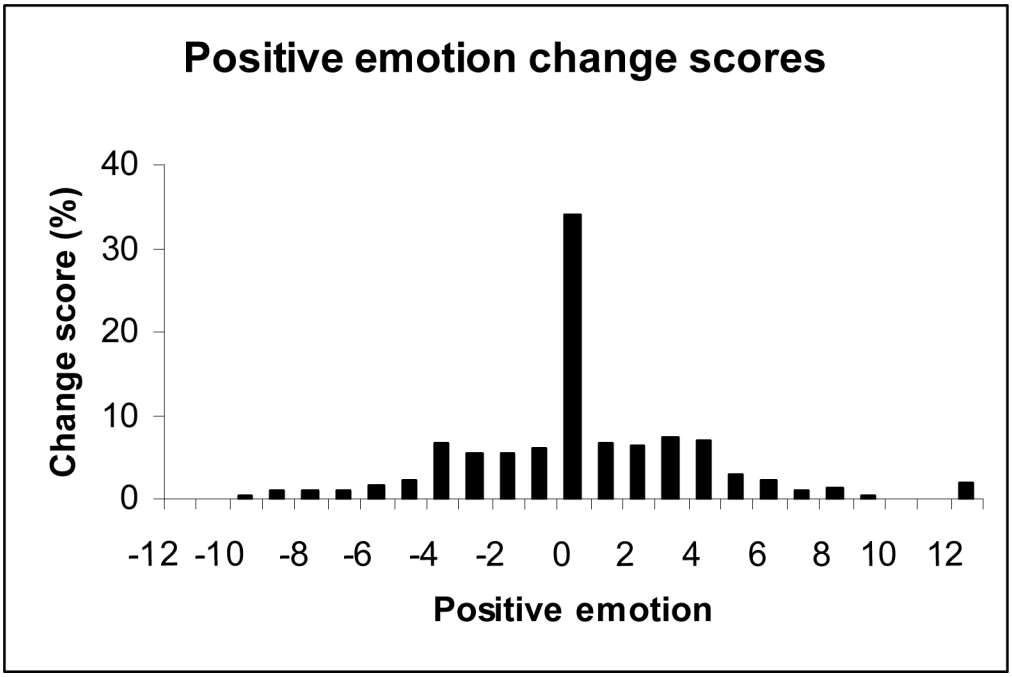

Figure.
Positive emotion change scores from discharge to 3 month follow-up.

Table 1

Sociodemographic and health related characteristics of patients with stroke at discharge from in-patient medical rehabilitation facility (n = 856).

Patient Characteristic	Total Sample
Age (%)	
55 − 64	23.1
65−74	29.7
75 − 84	35.6
≥ 85	11.6
Gender (%)	
Men	48.1
Women	51.9
Ethnicity (%)	
Non-Hispanic white	78.7
Non-Hispanic black	15.7
Hispanic	5.6
Marital status (%)	
Unmarried	46.7
Married	53.3
Education (%)	
< 12 years	21.5
≥ 12 years	78.5
Comorbidities (%)	
0	23.8
1	44.2
≥ 2	32.0
Depressive symptoms (%)	
< 16	30.7
≥ 16	69.3
Total FIM score (Mean, SD)	79.3 (SD 24.2)

Table 2

Sociodemographic and health related characteristics at discharge associated with positive emotion at 3 month follow-up for patients with stroke (n = 856).

Discharge Characteristic	Model 1			Model 2			Model 3		
	b	(SE)	p	b	(SE)	p	b	(SE)	p
Age (continuous)	−0.06	(.10)	.54	−0.01	(.10)	.95	−0.04	(.13)	.76
Men (vs. women)	0.06	(.20)	.75	−0.003	(.20)	.99	−0.24	(.25)	.34
Non-Hispanic black (vs. non-Hispanic white)	−0.12	(.27)	.65	−0.22	(.26)	.41	−0.35	(.33)	.29
Hispanic (vs. non-Hispanic white)	−0.62	(.44)	.16	−0.65	(.42)	.12	−0.09	(.50)	.86
Married (vs. unmarried)	0.03	(.20)	.87	0.15	(.20)	.46	0.37	(.25)	.14
Education (continuous)	0.10	(.03)	.003	0.08	(.03)	.008	0.08	(.04)	.04
Stroke type				0.08	(.13)	.56	0.20	(.17)	.23
Body involvement				0.13	(.09)	.17	0.29	(.11)	.01
LOS (continuous)				0.01	(.01)	.18	0.01	(.01)	.31
FIM total (continuous)				0.03	(.004)	.0001	0.04	(.006)	.001
Depression (continuous)				−0.07	(.01)	.0001	−0.05	(.02)	.0001
Comorbidities (0−5)				−0.05	(.11)	.65	−0.11	(.14)	.44
FIM change score							0.04	(.008)	.0001
Positive emotion (continuous)	0.45	(.03)	.0001	0.29	(.04)	.0001	0.70	(.05)	.0001
R^2		0.21			0.28			0.33	