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Socioeconomic disparities in work performance following mild stroke

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Abstract

Purpose—The purpose of this study was to investigate the relationships among the factors that influence return to work for young individuals with mild stroke from different socioeconomic backgrounds.

Methods—Prospective cohort study of working adults with mild stroke ($N = 21$). Participants completed an assessment battery of cognitive, work environment, and work performance measures at approximately three weeks and seven months post mild stroke. Individuals were placed in “skilled” and “unskilled” worker categories based on the Hollingshead Index.

Results—Unskilled workers had significantly poorer scores on the majority of the cognitive assessments. Unskilled workers also perceived less social support ($p = 0.017$) and autonomy ($p = 0.049$) in work responsibilities than individuals in the skilled worker group and also reported significantly poorer work productivity due to stroke than those in the skilled group ($p = 0.015$).

Conclusions—Individuals from low socioeconomic backgrounds have more difficulty returning to work following mild stroke than individuals from higher socioeconomic backgrounds. Future work is needed to identify factors that can increase long-term work success and quality of work performance following a mild stroke that specifically targets the needs of individuals who have a lower socioeconomic status.

Keywords

stroke; socioeconomic disparities; return to work; employment outcomes

INTRODUCTION

Stroke is a major cause of serious, long-term disability in the United States, with an estimated 795,000 strokes occurring every year.¹ Traditionally a disease of late adulthood, stroke is increasingly affecting younger individuals still actively involved in productive

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DECLARATION OF INTEREST

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employment and community roles.² Like older individuals, young people with stroke often experience decreased participation in major life roles and responsibilities.^{3,4} Higher chronic stroke costs for younger individuals, however, suggest the primary effects of the condition are increasingly felt long after the acute phase of recovery.^{5,6} Displacement from productive work and community roles has substantial financial and health consequences as individuals live longer with stroke.

Nearly half of all strokes are neurologically mild, making the long-term effects of stroke even more insidious.⁷ Many younger individuals with mild stroke (NIHSS score ≤ 5) are able to complete self-care activities independently but cannot meet the demands of their former work and community roles upon acute hospital discharge.^{8,9} Lost productivity and absenteeism in these previous work and community roles comprise \$15 billion of the \$40.9 billion price tag of stroke.¹ Nearly 50% of previously working individuals either never attempt to return to work following mild stroke or are met with failure when they do.¹⁰ Although it is possible that a percentage of these individuals were not working prior to stroke, these statistics highlight a discrepancy between anticipated work performance following hospital discharge and the actual performance of these individuals in their places of employment. Cognitive deficits not detected with typical screening measures may make it difficult for these individuals to meet former job demands under previous work conditions. It is not known which cognitive and/or work environment constructs most influence perceived or actual work ability and performance among individuals who do return to work. Additionally, it is not known if certain individuals may be more vulnerable to return to work difficulties due to pre-existing social circumstances with chronic and cumulative effects.

The majority of individuals with stroke are from low socioeconomic backgrounds, and remain or continue to live in these circumstances following the neurological event.¹¹ Low socioeconomic status (SES) predisposes individuals to stroke, and continues to influence everyday life following acute hospital discharge.¹¹ During rehabilitation, individuals from low socioeconomic backgrounds receive lower motor and functional recovery scores at admission and discharge than individuals with higher education and income, independent of stroke severity.¹² In a VA study, individuals from low socioeconomic backgrounds were found to experience worse functional outcomes in the acute stage of stroke than individuals who had a higher SES.¹³ It is clear that individuals who have a lower SES face greater barriers to recovery immediately post-stroke than individuals from high socioeconomic backgrounds. It is unknown, however, if these observed differences in performance across social strata persist beyond the acute medical stages of stroke. Many individuals with mild stroke, regardless of SES, are discharged from the acute hospital with little to no rehabilitation services.² People from low socioeconomic backgrounds who experience mild stroke may also face additional challenges. These individuals return to the same home, work, and community environments that initially contributed to stroke in the first place and now do not afford them the resources necessary for recovery.¹¹ This study investigated relationships among the factors that influence work performance for individuals with mild stroke from different socioeconomic backgrounds. We sought to determine if, among an employed cohort of individuals with mild stroke, those who had a low SES were more vulnerable to decreased work ability and job performance. This study explored potential

disparities within and across SES groups in the domains of work performance, cognitive ability and work environment.

The theoretical hypothesis of this study was that individuals who had a lower SES would demonstrate poorer work performance after returning to work following mild stroke than those from higher socioeconomic backgrounds. We predicted differences between groups would persist when controlling for age and stroke severity (NIHSS score).

METHODS

Design

This study used a prospective cohort design to examine work performance and the cognitive (i.e., memory, attention/impulsivity, executive function, general intelligence) and environmental (i.e., perceived work environment, social support, and cognitive demand of the job) constructs related to the completion of job-related tasks among individuals from high and low socioeconomic backgrounds. The current investigation was an extension of preliminary work conducted in the field confirming the role of both executive function and workplace conditions in return to work outcomes.^{14,15} The study was approved by the Washington University Human Research Protection Office. Participants (n=21) completed an assessment battery of neuropsychological assessments and work information questionnaires, approximately three weeks following mild stroke. Six to eight months later, these same individuals completed a follow-up phone interview focused on work productivity, work ability, and employment outcomes. The Hollingshead Four Factor Index was used to categorize individuals according to SES.¹⁶ Individuals were then placed into unskilled and skilled worker groups based on Hollingshead classification for purposes of comparison.

Participants and Methodology

Participants with mild stroke (n=24) were recruited from the Cognitive Rehabilitation Research Group (CRRG) database, which contained acute stroke data for over 14,000 individuals in Saint Louis, Missouri at the time of data collection. Individuals met the inclusion criteria for this study if they 1) spoke English, 2) were between the ages of 18–65, 3) had experienced a mild stroke (NIHSS score ≤ 5), and 4) were working full-time at the time of stroke and at least part time at the follow-up assessment. Individuals were excluded from the study if they had: 1) a history of any other neurological or mental health disorder besides stroke; 2) a history of a previous stroke; 3) a pre-morbid Barthel Index of <95 (indicating assistance was required for self-care activities prior to stroke); and/or 4) receptive or expressive aphasia (NIHSS aphasia sub-section score >0). Individuals who met the inclusion criteria were recruited approximately three weeks post-stroke from the CRRG stroke registry. Individuals who agreed to participate in the study visited the Washington University in St. Louis Program in Occupational Therapy to complete a face to face initial assessment lasting three hours. After giving informed consent, participants completed an assessment battery of neuropsychological assessments and work environment questionnaires. The neuropsychological assessments measured attention/impulsivity, memory, executive function, and general intelligence.

Assessments

Short Blessed Test (SBT)¹⁷—The SBT assessed alertness, orientation, attention, and short term memory. Total scores were used for analysis. Scores less than or equal to 8 indicate mild to moderate impairment, 9–19 moderate impairment, and 20–28 severe impairment.

Wechsler Memory Scale (WMS-III)¹⁸—The Digit Span Forward (WMS-DSF)/Backward (WMS-DSB) and Spatial Span Forward (WMS-SSF)/Backward (WMS-SSB) subtests of this measure assessed verbal working memory. Longest span was used for analysis.

Delis-Kaplan Executive Function System (DKEFS)¹⁹—The DKEFS Trail-Making subtests assessed visual scanning patterns, number sequencing, letter sequencing, number-letter switching, and motor speed. The DKEFS Color-Word Interference subtests assessed color reading, word naming, inhibition, and inhibition/Switching. The DKEFS Trail-Making Condition 4 scaled scores for number-letter switching were used during analysis.

California Verbal Learning Test-II (CVLT-II)²⁰—The CVLT-II assessed verbal memory across six trials: Immediate Free Recall (IFR), Short-Delay Free Recall (SDFR), Short-Delay Cued Recall (SDCR), Long Delay Free Recall (LDFR), Long-Delay Cued Recall (LDCR), and Long-Delay Yes/No Recognition (LDR). Number of correct responses, repetitions, and intrusions were calculated. Standard scores were used for purposes of analysis.

Connor's Continuous Performance Test (CPT)²¹—The CPT recorded item omissions, commissions (number of times person responds to a non-target item), hit reaction time, hit reaction time standard error, variability of standard error, attentiveness, perseverations, vigilance (reaction time and standard error), and adjustment to presentation speed (reaction time and standard error). T-scores were calculated and used in the current study.

Wechsler Test of Adult Reading (WTAR)²²—The WTAR measured general intelligence and required participants to pronounce a 50 item vocabulary list of increasing difficulty. Standard scores were calculated and used during analysis.

Moos Work Environment Scale (WES)²³—The 90-item R form of the WES measured employees' perceptions of their current work environment in the domains of work involvement, coworker cohesion, supervisor support, autonomy, task orientation, work pressure, clarity, managerial control, innovation and physical comfort. Standard scores were used for purposes of analysis.

Work Information Questionnaire—The Work Information Questionnaire utilized the Occupational Information Network (O*NET) to classify jobs according to cognitive, physical, psychomotor, and sensory demand. Subscores ranged from 0 (not required at all) to 100 (essential for the job). The average of all subscores provided a composite score for

each occupation that represents the extent to which the job requires each skill domain for successful completion. These averaged subscores were used in the current study.

Hollingshead Four Factor Index¹⁶—Numerous measures of social status have been introduced over the past century in the study of public health disparities. Previous literature has highlighted that individual variables of SES (i.e., education, income, wealth) are not interchangeable and that composite measures of multiple constructs best approximate true SES.²⁴ The Hollingshead Four Factor Index was selected among established social strata composite measures due its wide-scale use in public health research and accommodation of a broad range of educational and occupational backgrounds.¹⁶ Individuals were initially categorized into five Hollingshead social strata categories using the total score from the Index. The measure assigns a value from 1 to 7 for an individual's education level and a value from 1 to 9 for occupational title. Total score on the measure is determined by weighting and summing scaled education and job title values. Total scores range from 8 to 66, with higher scores indicating a more favorable socioeconomic situation. Individuals fall into one of five social strata categories based on their total score within this range. Due to small sample size, the current study collapsed these original five categories into “skilled” (n=12) and “unskilled” (n=9) labor groups based on job title descriptive characteristics for purposes of comparison (Figure 1).

Stanford Presenteeism Scale (SPS-6)²⁵—The SPS-6 is a six item measure of Employee Productivity and Health Status with established internal consistency, concurrent, and discriminant validity.²⁵ Questions assessed an individual's perception of his or her ability to accomplish job-related tasks and meet an expected level of productivity. Individuals were assigned a value of one to five on each of the six items for a total score ranging from 6 to 30, with higher scores indicating better work productivity and performance. Total scores were used for statistical analysis.

Work Ability Index Questionnaire (WAI)²⁶—The WAI was the outcome measure for work ability in the current study. The measure assessed this construct through a series of questions that consider the following: perceived work ability compared to lifetime best (scores range from 0–10), perceived work ability in relation to the demands of the job (scores range from 2–10), number of current diseases diagnosed by a physician (scores range from 1–7), estimated work impairment due to diseases (scores range from 1–6), sick leave during the past year (scores range from 1–5), own prognosis of work (scores range 1–7), and mental resources (scores range from 1–4). Scores were added to give an overall score, with higher scores indicating greater work ability and successful return to work. Index scores were used for statistical analysis.

Data Processing and Statistical Analysis

All analyses were completed using SPSS 18.0 for Windows. An independent samples t-test was initially conducted to determine whether a participant's assignment to either the skilled or unskilled worker group might truly be indicative of SES. The analysis used income and participants' job demands collected from the Occupational Information Network (O*NET) measure to determine the extent to which skilled and unskilled individuals had job

characteristics typical of either white or blue collar job positions, respectively. Descriptive statistics were conducted to examine and highlight demographic differences within and between the skilled and unskilled participant groups. Independent samples t-tests were used to examine differences between skilled and unskilled groups on the cognitive, work environment, and job performance assessments described in table 1. When appropriate, descriptive statistics were applied to items on the work performance measures to explore specific differences in work productivity between skilled and unskilled workers. Finally, Bonferroni correction was used to correct for multiple comparisons of constructs.

RESULTS

Table 1 shows the results of the independent samples t-test to provide baseline validity for the use of skilled and unskilled worker groups to represent high and low socioeconomic conditions, respectively. Overall, skilled workers had significantly higher incomes, were employed in jobs with significantly higher cognitive demand, significantly lower physical demand, and significantly lower psychomotor demands than unskilled workers. As expected, no significant differences were found in the sensory demands of the jobs of skilled and unskilled workers.

Demographic characteristics of both groups can be seen in table 2. On average, participants completed the initial assessment less than one-month post stroke ($M=24.38$ days, $SD=13.13$ days) and the follow-up assessment approximately seven months post-stroke ($M=208.48$ days, $SD=34.75$ days). Participants returned to work on average around one month post-stroke ($M=29.33$ days, $SD=28.73$ days). As hypothesized, individuals in the unskilled worker group did not significantly differ from the skilled worker group in age or NIHSS score. Unskilled workers were more commonly African American, had significantly more chronic conditions, and lower levels of education than skilled workers.

Table 3 outlines the results of the independent samples t-test that compared skilled and unskilled workers on cognitive performance. As predicted, participants in the unskilled labor group performed much more poorly on a number of cognitive measures, including the Delis-Kaplan Executive Function System (DKEFS) Trails Condition 4, Short-Blessed Test, Short and Long Delay Free Recall, Spatial Span Forward (Longest Span), Digit Span Forward and Backward (Longest Span), and intelligence (table 4). Following Bonferroni correction to correct for multiple comparisons, significant differences between groups remained for the Delis Kaplan Executive System (DKEFS) Trails Condition 4, Short-Blessed Test, Short and Long Delay Free Recall, and intelligence ($p<0.005$).

The results of the independent samples t-test that compared the work environments of skilled and unskilled workers can be seen in table 4. Individuals in the unskilled worker group reported significantly less favorable work environments than individuals in the skilled group. Specifically, they perceived less supervisor support and work autonomy following mild stroke than individuals in the skilled worker group ($p<0.05$). Following Bonferroni corrections, no significant differences in work environment across groups remained.

Lastly, differences in the return to work experience were noted. Specifically, unskilled workers rated themselves as significantly less productive at work due to stroke than their skilled working counterparts (table 5). Although no significant differences in perceived overall work ability were reported, differences in the perceived effect of stroke on capacity for work and expectations of job success were observed. For example, whereas 75% (n=9) of individuals in the skilled work group perceived stroke as having no effect on job completion, only 22% (n=2) of individuals in the unskilled group felt this way. Similarly, whereas 92% (n=11) of skilled workers expected to be working in their current job two years in the future, only 67% (n=6) of unskilled workers believed their current work would be sustainable.

DISCUSSION

The current study underscores the unique challenges individuals from low socioeconomic backgrounds face when returning to work following mild stroke compared to those who have a higher SES. It has long been recognized that individuals with a low SES are the most likely group to experience stroke.^{11,12} The current study suggests, however, that these individuals may also have poorer outcomes following stroke than individuals who have a higher SES, even when the stroke is neurologically mild and of similar severity. Participants in the unskilled work condition did not differ from individuals in the skilled work condition in stroke severity (i.e., NIHSS score), age, or average time to return to work, yet reported and demonstrated significantly poorer performance on a number of work-related constructs. These disparities were most noticeable in performance on the cognitive assessments. The significantly lower education levels reported by those in the unskilled group may partially account for these differences. Education has been shown to account for 10–20% of the variance in scores on many common assessments of executive function, language, memory, and visuospatial function.²⁷ This effect persists in basic cognitive screens of attention and orientation.^{28,29} The possibility of educational effects in the current study suggests the observed differences between groups in cognitive performance may not reflect new disparities in cognitive ability caused by the mild stroke event itself.

Significant differences in perceived work environment highlight potential factors which may add increased challenge to the return to work experience. The significantly poorer supervisor support and autonomy perceived by individuals in the unskilled group suggests two potential hypotheses for future investigation. First, the jobs individuals who have a low SES hold may provide less flexibility/accommodation for meeting job demands following a disabling event. Second, the lack of observable physical deficits following mild stroke may lead to misunderstanding in the workplace of decreased work performance, especially among individuals who have a lower SES.

Results from the cognitive and work environment measures highlight a number of challenges faced by individuals with mild stroke from low socioeconomic backgrounds, but the extent to which mild stroke contributed to these difficulties is unclear. Individuals with a low SES who are in unskilled work positions report a significantly greater number of chronic health conditions than individuals who have a high SES in skilled employment (table 2). These health conditions, rather than mild stroke, may have contributed to both

poorer cognitive performance and perception of work environment over time. Results from the Stanford Presenteeism Scale, however, suggest mild stroke does play a role. The measure specifically assesses work productivity challenges arising from the condition of interest (i.e., mild stroke). Individuals in the unskilled work group reported significantly greater decreases in work productivity due to stroke than skilled individuals. They were also three times more likely to identify stroke as being a hindrance to their job. These findings suggest that something about the stroke event impacted confidence for meeting job expectations. These concerns about work productivity and performance among individuals with low SES persist beyond the immediate stage of stroke. Individuals in the unskilled work condition also expressed confidence they would be able to hold their current job two years in the future at a lower rate than individuals with higher SES. Given that participants in both groups averaged 50 years of age, concerns about long term work ability have troubling financial and health implications for individuals still years from typical retirement age.^{30,31}

Limitations

The small sample size in the study limited the number of analyzes that were conducted among different constructs, which may affect both the scope and impact of the findings. The study could also not account for all of the potential variables that contribute to SES, especially those that reflect the collective social or economic situation of a community or neighborhood and do not respond to objective measurement. An established, well-known composite measure of SES was used to maximize the accuracy of participant classification. It is impossible to assert, however, that the socioeconomic category to which an individual was assigned was entirely representative of the individual's everyday social and economic conditions. It is also possible that the skilled/unskilled work groups created in light of the small sample size do not completely represent the socioeconomic conditions outlined by the original Hollingshead social strata categories. This is especially true for individuals who fell near the middle of the socioeconomic continuum. Nevertheless, statistical comparisons of the skilled and unskilled work groups to other indicators of social and economic status provide a baseline level of validation for the decision to collapse the original groups.

Summary/Conclusions

Individuals with a low SES face a number of social, economic, cultural, and health challenges following mild stroke not as commonly faced by individuals with greater access to capital and resources. Further research is needed for understanding potential cognitive and work environment strategies that could buffer the individual against long term return to work failure. in the face of a multitude of negative pre- and post-stroke situations. Although changing someone's SES is impractical, initiatives aimed at decreasing the negative consequences of low SES are not. A mixed-methods follow-up study recruiting employed individuals with low SES post-mild stroke could identify constructs that were most supportive in return to work and/or continuing to work. Alternatively, this future study could recruit unemployed individuals from low socioeconomic backgrounds to uncover aspects of return to work that are particularly difficult for this demographic group. The study also has a number of implications for the acute care assessment process when making discharge recommendations, as well as potential areas of intervention while the individual is still in the

hospital. Although individuals with low SES demonstrated markedly poorer cognitive ability than individuals with high SES, they were often discharged from the hospital with no additional rehabilitation services. The current study suggests follow-up care may be necessary for individuals with mild stroke, especially those who have a low SES. Short-term services for detecting and preparing for potential return to work challenges could decrease the long term, indirect costs of stroke. Future studies could identify not only which aspects of return to work are most difficult, but also the best approach for addressing them. The information gained could be used in the long run to advocate for increased and/or innovative return to work rehabilitation services for individuals with low SES and the mild stroke population in general.

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References

1. Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, Carnethon MR, Dai S, de Simone G, Ford ES, et al. Heart Disease and Stroke Statistics—2011 Update: A Report From the American Heart Association. *Circulation*. 2011; 123(4):e18–e209. [PubMed: 21160056]
2. Wolf TJ, Baum C, Conner LT. Changing face of stroke: implications for occupational therapy practice. *American Journal of Occupational Therapy*. 2009; 63(5):621–5. [PubMed: 19785261]
3. Lawrence M. Young adults' experience of stroke: a qualitative review of the literature. *Br J Nurs*. 2010; 19(4):241–8. [PubMed: 20220675]
4. Röding J, Glader E-I, Malm J, Eriksson M, Lindström B. Perceived impaired physical and cognitive functions after stroke in men and women between 18 and 55 years of age – a national survey. *Disability and Rehabilitation*. 2009; 31(13):1092–1099. [PubMed: 19802925]
5. Grade A, Grade B, Grade C, Grade D. US cost burden of ischemic stroke: a systematic literature review. *Am J Manag Care*. 2010; 17(7):525–533.
6. Lawrence M, Kinn S. Determining the needs, priorities, and desired rehabilitation outcomes of young adults who have had a stroke. *Rehabilitation research and practice*. 2012; 2012:963978–963978. [PubMed: 22852087]
7. Hildebrand M, Brewer M, Wolf T. The impact of mild stroke on participation in physical fitness activities. *Stroke research and treatment*. 2012; 2012:548682–548682. [PubMed: 22013551]
8. Wolf, T.; Baum, MC. Improving participation and quality of life through occupation. In: Gillen, G., editor. *Stroke Rehabilitation: A Function-Based Approach*. 2. 2011.
9. Wolf TJ. Participation in work: The necessity of addressing executive function deficits. *Work: A Journal of Prevention, Assessment and Rehabilitation*. 2010; 36(4):459–463.
10. O'Brien AN, Wolf TJ. Determining work outcomes in mild to moderate stroke survivors. *Work*. 2010; 36(4):441–7. [PubMed: 20714100]
11. Bravata DM, Wells CK, Gulanski B, Kernan WN, Brass LM, Long J, Concato J. Racial disparities in stroke risk factors: the impact of SES. *Stroke*. 2005; 36(7):1507–11. [PubMed: 15961710]
12. Putman K, De Wit L, Schoonacker M, Baert I, Beyens H, Brinkmann N, Dejaeger E, De Meyer A-M, De Weerd W, Feys H, et al. Effect of SES on functional and motor recovery after stroke: a European multicentre study. *Journal of Neurology, Neurosurgery & Psychiatry*. 2007; 78(6):593–599.
13. Horner RD, Swanson JW, Bosworth HB, Matchar DB. for the VA Acute Stroke Study Team. Effects of Race and Poverty on the Process and Outcome of Inpatient Rehabilitation Services Among Stroke Patients. *Stroke*. 2003 01.STR.0000060028.60365.5D.
14. Wolf T, Barbee A, White D. Article 15 Executive Dysfunction Immediately Post Mild-Stroke. *Archives of physical medicine and rehabilitation*. 2012; 93(10):e11.

15. Alaszewski A, Alaszewski H, Potter J, Penhale B. Working after a stroke: survivors' experiences and perceptions of barriers to and facilitators of the return to paid employment. *Disability & Rehabilitation*. 2007; 29(24):1858–69. [PubMed: 17852252]
16. Hollingshead ADB. Four factor index of social status. Yale Univ., Department of Sociology; 1975.
17. Katzman R, Brown T, Fuld P, Peck A, Schechter R, Schimmel H. Validation of a short Orientation-Memory-Concentration Test of cognitive impairment. *American Journal of Psychiatry*. 140(6):734–9. [PubMed: 6846631]
18. Wechsler, D. Wechsler Memory Scale®. 3. San Antonio, TX: Harcourt Assessment; 2003. (WMS---III)
19. Delis, Dean C, Kramer JH, Kaplan E, Holdnack J. Reliability and validity of the Delis-Kaplan Executive Function System: An update. *Journal of the International Neuropsychological Society*. 2004; 10(02):301–303. [PubMed: 15012851]
20. Delis, DC.; Kramer, JH.; Kaplan, E.; Ober, BA. The California Verbal Learning Test. San Antonio: The Psychological Corporation; 2000.
21. Conner, CK. Conners' CPT II continuous performance test II. North Tonawanda, NY: Multi Health Systems; 2004.
22. Wechsler, D. Wechsler Test of Adult Reading: WTAR. Psychological Corporation; 2001.
23. Moos, RH. A social climate scale: Work environment scale manual. Palo Alto, CA: Consulting Psychologists Press; 1994.
24. Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, Posner S. SES in health research: one size does not fit all. *JAMA*. 2005; 294(22):2879–88. [PubMed: 16352796]
25. Koopman C, Pelletier KR, Murray JF, Sharda CE, Berger ML, Turpin RS, Hackleman P, Gibson P, Holmes DM, Bendel T. Stanford Presenteeism Scale: Health Status and Employee Productivity. *Journal of Occupational and Environmental Medicine*. 2002; 44(1):14–20. [PubMed: 11802460]
26. Ilmarinen J. The Work Ability Index (WAI). *Occupational Medicine*. 2007; 57(2):160.
27. Ganguli M, Snitz BE, Lee C-W, Vanderbilt J, Saxton JA, Chang C-CH. Age and education effects and norms on a cognitive test battery from a population-based cohort: The Monongahela–Youghiogheny Healthy Aging Team. *Aging & Mental Health*. 2010; 14(1):100–107. [PubMed: 20155526]
28. Lorentz WJ, Scanlan JM, Borson S. Brief screening tests for dementia. *Can J Psychiatry*. 2002; 47(8):723–33. [PubMed: 12420650]
29. Mejia S, Gutierrez LM, Villa AR, Ostrosky-Solis F. Cognition, functional status, education, and the diagnosis of dementia and mild cognitive impairment in Spanish-speaking elderly. *Applied Neuropsychology*. 2004; 11(4):196–203. [PubMed: 15673491]
30. Brown DL, Boden-Albala B, Langa KM, Lisabeth LD, Fair M, Smith MA, Sacco RL, Morgenstern LB. Projected costs of ischemic stroke in the United States. *Neurology*. 2006; 67(8):1390–1395. [PubMed: 16914694]
31. Gallo WT, Teng HM, Falba TA, Kasl SV, Krumholz HM, Bradley EH. The impact of late career job loss on myocardial infarction and stroke: a 10 year follow up using the health and retirement survey. *Occupational and Environmental Medicine*. 2006; 63(10):683–687. [PubMed: 16798871]

Figure 1.
Participant assignment to Hollingshead social strata and skilled/unskilled worker groups

Table 1

Job characteristics and income across skilled/unskilled worker groups

	Skilled Workers (n=12)	Unskilled Workers (n=9)		
	Mean		t	p
ONET average cognitive scores	51.18 SD 5.10	38.46 SD 7.60	4.595	0.000**
ONET average physical scores	7.94 SD 11.68	25.73 SD 5.88	-4.171	0.001*
ONET average psychomotor scores	15.08 SD 14.85	31.57 SD 13.56	-2.610	0.017*
ONET average sensory scores	29.34 SD 7.17	32.19 SD 11.23	-0.711	0.486
Income	52175.00 SD 14619.75	24765.56 SD 6355.54	5.239	0.000**

*
p<0.05;**
p<0.001

Table 2

Participant demographics

	Skilled workers (n=12)	Unskilled workers (n=9)
	Mean	
Years of education *	15.42 SD 1.88	13.33 SD 2.40
NIHSS Total	0.92 SD 1.17	0.78 SD 0.97
Age	51.17 SD 7.33	49.67 SD 7.75
Number of current chronic diseases **	5.92 SD 3.06	12.67 SD 6.36
	Percentage	
Race SD % Caucasian) **	83%	0%
Sex SD % male)	42%	33%
Discharge location SD %home with no services)	33%	56%

*
p<0.05;

**
p<0.005

Table 3

Cognitive performance across worker groups

	Skilled workers (n=12)	Unskilled workers (n=9)		
	Mean		t	p
DKEFS Trails Condition4	11.92 SD 1.38	6.44 SD 3.61	4.836	0.000**
Total short blessed score	0.33 SD 0.78	5.44 SD 4.22	-4.141	0.001**
WMS-DSF: Longest Span	6.92 SD 1.24	5.22 SD 1.39	2.939	0.008*
WMS-DSB: Longest Span	5.50 SD 1.57	3.89 SD 1.27	2.522	0.021*
WMS-SSF: Longest Span	6.17 SD 0.39	5.22 SD 0.97	3.074	0.006*
WMS-SSB: Longest Span	5.50 SD 1.00	4.89 SD 1.17	1.291	0.212
CVLT-II Number Correct Standard Trials 1–5 Total	55.25 SD 7.29	45.00 SD 9.50	2.803	0.011*
CVLT-II Number Correct SDFR Standard	0.33 SD 0.65	-1.22 SD 1.30	3.602	0.002**
CVLT-II Number Correct LDFR Standard	0.50 SD 1.09	-1.33 SD 1.32	3.488	0.002**
CESD total	13.58 SD 5.66	15.67 SD 13.15	-0.494	0.627
WTAR Standard Score:	113.42 SD 9.22	89.00 SD 16.50	4.326	0.000**

*
p<0.05;**
p<0.005 (Bonferroni)

Table 4

Environmental work conditions across worker groups

	Skilled Workers (n=11) *	Unskilled Workers (n=9)		
	Mean		t	p
Involvement Standard	53.73 SD 10.82	48.78 SD 11.13	1.005	0.328
Cohesion Standard	51.09 SD 9.17	48.67 SD 6.12	0.677	0.507
Support Standard:	53.45 SD 15.25	37.44 SD 11.16	2.622	0.017**
Autonomy Standard:	57.45 SD 9.98	47.33 SD 11.53	2.105	0.049**
Task Orientation Standard:	55.64 SD 7.16	50.11 SD 10.19	1.423	0.172
Work Pressure Standard:	53.64 SD 13.54	49.78 SD 9.28	0.725	0.478
Clarity Standard:	47.64 SD 9.19	48.56 SD 10.98	-0.204	0.841
Control Standard:	49.00 SD 11.85	57.44 SD 11.93	-1.581	0.131
Innovation Standard:	51.82 SD 12.42	42.89 SD 9.32	1.782	0.092
Comfort Standard:	50.10 SD 13.23	54.44 SD 9.57	-0.812	0.428

* Data missing from one participant in the skilled worker group

** p<0.05

Table 5

Perceived work performance across worker groups

	Skilled Workers (n=12)	Unskilled Workers (n=9)		
	Mean (Standard Deviation)		t	p
Total SPS Score:	28.50 SD 1.93	22.33 SD 7.71	2.681	0.015*
Work Ability Index Sum Score	37.00 SD 6.98	31.67 SD 9.93	1.449	0.164

*
p<0.05