Self-Awareness and Recovery of Independence With Strategy Training

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OBJECTIVE. Poor self-awareness co-occurs with cognitive impairments after stroke and may influence independence in daily activities. Strategy training promotes independence after stroke, but poor awareness may attenuate treatment response. We examined the degree to which awareness status affected changes in independence attributed to strategy training.

METHOD. We conducted a secondary analysis of 30 participants with cognitive impairments after acute stroke randomized to strategy training or attention control in addition to typical inpatient rehabilitation. We measured awareness with the Self-Awareness of Deficits Interview and independence with the FIM™. Data were analyzed using general linear models.

RESULTS. Poor awareness attenuated improvements in independence over time, $F(3, 55) = 3.04, p = .038$. Strategy training promoted greater improvements in independence over time relative to attention control, $F(3, 55) = 5.93, p = .002$. However, the interaction between awareness and intervention was not significant, $F(1, 19) = 0.025, p = .877$.

CONCLUSION. Awareness status may not affect the response to strategy training, indicating that strategy training may benefit people with poor awareness.

Skidmore, E. R., Swafford, M., Juengst, S. B., & Terhorst, L. (2018). Brief Report—Self-awareness and recovery of independence with strategy training. *American Journal of Occupational Therapy*, 72, 7201345010. <https://doi.org/10.5014/ajot.2018.023556>

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Among the many factors that may influence functional recovery after stroke, *anosognosia*, that is, impaired self-awareness or lack of insight into one's abilities and deficits, can be particularly problematic (Fleming, Strong, & Ashton, 1996). People with poor awareness of their abilities often exhibit poor judgment and require supervision during functional activities to ensure their safety (Golisz & Togli, 1998). As a result, they are generally less likely to regain independence in self-care and mobility activities compared with people with good awareness of their abilities (Ekstam, Uppgard, Kottorp, & Tham, 2007; Hartman-Macir, Soroker, Ring, & Katz, 2002).

Metacognitive strategy training, hereafter referred to as *strategy training*, has shown promise for promoting restoration of independence in people with stroke-

related cognitive impairments (Skidmore et al., 2011). Strategy training teaches people to identify problems with daily activities (through guided self-assessment and self-monitoring), develop goals and plans to address problems, and improve their ability to perform desired activities (thus promoting independence; Skidmore et al., 2015). Although strategy training shows promise for people with cognitive impairments in general, the question remains as to whether people with self-awareness impairments in particular can benefit from strategy training. Given the self-reflective nature of intervention, there is good reason to believe that people with poor self-awareness may not be able to safely engage in or benefit from strategy training. In this brief report, we present a secondary analysis of data examining whether self-awareness

influenced response to strategy training intervention (as measured by changes in independence over time).

Method

Participants

Data were gleaned from a previously published pilot study examining strategy training in people with stroke-related cognitive impairments (Skidmore et al., 2015). Participants had a recent stroke; were admitted to inpatient rehabilitation; had cognitive impairments, evident by a score of ≥ 3 on the Quick Executive Interview (EXIT; Larson & Heinemann, 2010); did not have moderate or severe aphasia, evident by a score ≥ 2 on the Boston Diagnostic Aphasia Examination (Goodglass, Kaplan, & Barressi, 2001); did not meet criteria for dementia, untreated mood disorder, psychotic disorder, or current drug or alcohol abuse (Sheehan et al., 1998; Spitzer et al., 1994); and had an expected inpatient rehabilitation length of stay of at least 5 days.

Procedure

Intervention procedures are described in detail elsewhere (Skidmore et al., 2014, 2015). Participants were randomly assigned to strategy training or an attention control condition. In both groups, research intervention sessions began with setting participant-selected goals using the Canadian Occupational Performance Measure (Law et al., 2014). In the strategy training group, participants addressed their self-selected goals by identifying problems or barriers to meeting their goals and applying a global strategy (i.e., Goal–Plan–Do–Check) to address these problems. Participants were supported in this process by guided discovery from the therapists. In the attention control group, participants engaged in a facilitated discussion with the therapists, who used scripted, open-ended questions to stimulate personal reflection on the participants' rehabilitation experiences.

In both groups, participants received 10 45-min research intervention sessions over 2 wk, in addition to the usual inpatient rehabilitation program. Trained occupational therapists conducted the research intervention sessions.

Measures

For the purposes of this secondary analysis, the Self-Awareness of Deficits Interview (SADI; Fleming et al., 1996) was used to characterize self-awareness status, and the FIM™ (Keith, Granger, Hamilton, & Sherwin, 1987) was used to characterize restoration of independence in daily activities. The SADI is a semi-structured interview that assesses a person's self-awareness of his or her deficits, the functional implications of deficits, and his or her ability to set realistic goals. Each of these items is rated on a 4-point scale ranging from 0 (*no disorder of self-awareness*) to 3 (*severe disorder of self-awareness*). In this study, the SADI was administered prospectively at baseline by trained raters. Interrater reliability on the three SADI items in our study was excellent (intraclass correlation coefficient [ICC] = .946, .970, and .970, respectively).

The FIM is an 18-item assessment used to measure the amount of assistance required for a person to perform self-care, sphincter control, mobility, locomotion, communication, and social cognition activities. Each item is rated on a 7-point scale ranging from 1 (*total dependence*) to 7 (*independence*). The FIM is a valid and reliable measure for assessing independence in people with acute stroke (Cohen & Marino, 2000; Hobart et al., 2001). In this study, FIM scores were obtained prospectively at baseline, inpatient rehabilitation discharge, and 3 and 6 mo after baseline by trained raters. Interrater reliability on total FIM scores in our study was excellent (ICC = .953).

Data Analyses

For this analysis, participants' SADI scores were dichotomized into poor awareness (scores ≥ 1 for two or more items) or good awareness (all other values). By requiring minimal impairment in self-awareness in at least two of three items, we ensured a consistent pattern of poor awareness. Baseline differences among groups were examined with nonparametric analyses (χ^2 , Kruskal–Wallis test, as appropriate; McKnight & Najab, 2010). We used general linear models ($4 \times 2 \times 2$) to examine whether participants' independence in daily activities (FIM scores) improved over time (from baseline to discharge and to 3 and 6 mo after baseline) based

on awareness status (good awareness or poor awareness) and intervention assignment (strategy training or attention control). The general linear model is robust to the normality assumption and therefore appropriate for the study design and sample size.

Results

All 30 participants from the original pilot study were included in this analysis. Table 1 summarizes participant characteristics in four groups: (1) strategy training–poor awareness, (2) strategy training–good awareness, (3) attention control–poor awareness, and (4) attention control–good awareness. Nonparametric analyses detected differences between groups at baseline in education (the attention control–poor awareness group had significantly lower education than the other three groups) and stroke hemisphere (both poor awareness groups were more likely to have right-hemisphere lesions relative to left-hemisphere lesions compared with the good awareness groups).

Although not statistically significant, potentially meaningful differences were noted in mean time since stroke onset (the good awareness groups were more chronic compared with the poor awareness groups), mean EXIT scores (less impairment in the good awareness groups than in the poor awareness groups), and stroke severity (greater severity in the strategy training group than in the attention control group). These differences are not statistically significant because of the wide variation within groups, which is a function of small sample size. Given the small sample size, we did not control for these differences in the general linear model (Verbeke & Molenberghs, 2000).

General linear model analyses revealed an awareness by time interaction, $F(2.90, 54.99) = 3.04$, $p = .038$, indicating that good awareness was associated with greater improvements in independence than in poor awareness over time (partial $\eta^2 = .138$, small effect size; Figure 1). Findings also revealed an intervention by time interaction, $F(2.89, 54.99) = 5.93$, $p = .002$, indicating that strategy training was associated with greater improvements in independence over time than attention control (partial $\eta^2 = .238$, small to medium effect size; Figure 2). However, the interaction between awareness

Table 1. Baseline Participant Characteristics

Variable	Strategy Training Group		Attention Control Group		χ^2	<i>p</i>
	Good Awareness (<i>n</i> = 5), <i>n</i> (%) or <i>M</i> (<i>SD</i>)	Poor Awareness (<i>n</i> = 10), <i>n</i> (%) or <i>M</i> (<i>SD</i>)	Good Awareness (<i>n</i> = 6), <i>n</i> (%) or <i>M</i> (<i>SD</i>)	Poor Awareness (<i>n</i> = 9), <i>n</i> (%) or <i>M</i> (<i>SD</i>)		
Sex, male	4 (80)	7 (70)	4 (67)	5 (56)	0.95	.81
Age, yr	61.40 (15.95)	67.22 (14.31)	70.50 (16.26)	72.67 (11.71)	2.90 ^a	.41
Race, White	4 (80)	10 (100)	5 (83)	7 (78)	2.40	.49
Education, yr	15.60 (3.29)	14.00 (2.71)	16.00 (2.53)	12.22 (0.67)	8.03 ^a	.05
Time since stroke onset, days	20.00 (22.55)	15.20 (11.96)	25.50 (19.87)	10.55 (5.75)	2.12 ^a	.55
Stroke type, ischemic	3 (60)	7 (70)	4 (67)	7 (78)	0.53	.91
Hemisphere, right	1 (20)	9 (90)	3 (50)	7 (78)	8.60	.04
Stroke severity (NIHSS score) ^b	9.00 (2.83)	8.80 (2.90)	6.33 (3.14)	5.56 (2.56)	7.12 ^a	.07
Medical burden (CIRS score) ^b	2.61 (0.87)	2.46 (0.60)	2.50 (0.46)	2.44 (0.53)	0.25 ^a	.73
Cognitive status (EXIT score) ^b	6.40 (3.91)	9.00 (2.16)	7.20 (1.92)	10.63 (3.78)	4.78 ^a	.19
Independence (FIM™ score)	59.80 (8.01)	64.50 (12.68)	62.00 (14.83)	66.89 (17.85)	0.73 ^a	.87

Note. CIRS = Cumulative Illness Rating Scale; EXIT = Quick Executive Interview (14-item version); *M* = mean; NIHSS = National Institutes of Health Stroke Scale; *SD* = standard deviation.

^aKruskal–Wallis test. ^bLower scores = better health.

and intervention was not significant, and the effect size was negligible, $F(1, 19) = 0.025$, $p = .877$, partial $\eta^2 = .001$ (Figure 3). The three-way interaction (time $\times$ awareness $\times$ intervention) was not significant, $F(2.20, 41.82) = 0.54$, $p = .655$, and therefore was dropped from the model. This lack of significance may be a result of the small sample size.

Discussion

Findings from this secondary analysis of a small sample suggest that, in general, poor

awareness, relative to good awareness, is associated with an attenuated restoration of independence over time, and strategy training, relative to attention control, is associated with greater restoration of independence over time. However, contrary to our expectation, awareness status did not affect treatment response in the strategy training group. In other words, in this small sample, participants who received strategy training demonstrated similar improvements in independence over time regardless of awareness status.

Baseline differences in groups and their influence on study findings are dif-

ficult to interpret because of the small sample sizes in each group. It is not surprising that low education, right-hemisphere lesions, and greater cognitive impairment were associated with poor awareness, because these associations have been reported previously (Anderson & Tranel, 1989; Noé et al., 2005). The difference in education between the poor awareness–attention control group and the poor awareness–strategy training group may be the most confounding. The lower education of the poor awareness–attention control group may have accounted for attenuated changes in independence over time, whereas the higher education of the poor awareness–strategy training group may have accounted for improvements in independence observed in this second group. However, a larger prospective study is needed to examine these associations.

Baseline differences in stroke severity (the strategy training groups had greater severity than the attention control groups) were likely a function of inadequate sample size to ensure equal allocation. The strategy training groups demonstrated greater improvements in independence over time, which may have been because they had more capacity for improvement. Small sample size may also explain baseline differences in time since stroke onset; alternatively, there may be a reproducible and clinically meaningful association between awareness status and the time since stroke onset (i.e., more days between the onset of stroke and the onset of rehabilitation may

Figure 1. Awareness by time interaction.

Note. Error bars reflect standard error of the group mean.

Figure 2. Intervention by time interaction.

Note. Error bars reflect standard error of the group mean.

allow more time for deficits in awareness to resolve). Further investigation is warranted.

There are similarities in findings between this secondary analysis and a previously reported randomized clinical trial by Goverover, Johnston, Toglia, and Deluca (2007). Goverover and colleagues examined the efficacy of self-awareness training in people with chronic traumatic brain injury who demonstrated evidence of poor awareness. The self-awareness training program

closely resembled strategy training because participants were asked to define goals for task performance (similar to the Goal step in the current study), in this case, from a preselected list of activities; predict task performance; anticipate potential errors or barriers to task performance; and choose a strategy (including the amount of assistance needed) to address these potential errors or barriers (similar to the Plan step in the current study). After task completion

(similar to the Do step in the current study), participants completed a structured self-evaluation (similar to the Check step in the current study).

Goverover and colleagues (2007) reported that self-awareness training was associated with improved self-regulation and metacognitive skills as well as improved process skills during functional performance (i.e., how participants approached the task). However, they were not able to detect improvements in motor skills during functional performance (i.e., how participants executed the task) or community independence. In contrast, our study focused on people with acute stroke who had both good and poor awareness. We instructed participants to select their own activities to derive goals, and more sessions were provided (10 training sessions vs. 6). Although the current study did not assess change in self-awareness, people with good and poor awareness were determined to respond similarly to strategy training (and to attention control), as evident by improvements in independence over time.

The findings of this study cannot be generalized. The sample was too small, and the data were originally collected for a different purpose. Nonetheless, these findings suggest that it may be valuable to conduct larger prospective studies examining the benefits of strategy training for people with poor self-awareness, a frequent problem after stroke. The fact that there was no interaction effect for intervention group and awareness status was surprising. It is possible that the sample was too small to detect this interaction. Nonetheless, a plot of the data (Figure 3) suggests that people with poor awareness demonstrated greater improvements in independence in the strategy training group than did their counterparts in the attention control group. At minimum, these data seem to suggest that there does not appear to be a reason to exclude people with poor awareness from strategy training or similar metacognitive interventions until the nature of the association between self-awareness and strategy training response is better understood. ▲

Acknowledgments

Research funding was provided by the Eunice Kennedy Shriver National Center for Medical Rehabilitation Research (R01

Figure 3. Intervention by awareness interaction.

Note. Error bars reflect standard error of the group mean.

HD074693), the University of Pittsburgh Medical Center Rehabilitation Institute, the University of Pittsburgh K. Leroy Irviss Fellowship, and the University of Pittsburgh Office of Research Health Sciences. This article presents a secondary analysis of data gathered from a federally registered trial (NCT02755805; <http://www.clinicaltrials.gov>).

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