Belief, Confidence, and Motivation to Use the Paretic Upper Limb in Daily Life Over the First 24 Weeks After Stroke

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Background and Purpose: The recovery patterns of upper limb (UL) impairment after stroke are established. Psychosocial factors such as belief that paretic UL recovery is possible, confidence, and motivation to use the paretic UL in everyday tasks are unexplored early after stroke. The purpose of this exploratory study was to characterize belief, confidence, and motivation to use the paretic UL in daily life, and self-perceived barriers to UL recovery over the first 24 weeks after stroke.

Methods: This was a longitudinal cohort study (N = 30) with 8 assessment sessions over the first 24 weeks after stroke. Belief, confidence, and motivation to use the paretic UL and self-perceived barriers were quantified via survey and analyzed using descriptive statistics. Change in the number of self-perceived barriers between weeks 2 and 24 was tested using a paired-samples *t* test. The relationship between UL capacity, depressive symptomatology, cognition, and each psychosocial factor was examined using Spearman rank-order correlation analyses.

Results: Twenty-two participants completed all study assessments. Belief, confidence, and motivation were high across the 24 weeks, with little variation. There was no difference between the average number of barriers from weeks 2 to 24. There was no relationship between the clinical measures and psychosocial factors at week 2, 12, or 24.

Discussion and Conclusions: High levels of belief, confidence, and motivation appear consistent over the first 6 months after stroke. The lack of correlations between psychosocial factors and clinical measures suggests belief, confidence, and motivation may not be vulnerable to functional status early after stroke.

Video Abstract available for more insights from the authors (see the Video, Supplemental Digital Content 1 available at: http://links.lww.com/JNPT/A283).

Key words: *accelerometry, barriers, belief, performance stroke, upper limb*

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INTRODUCTION

A primary goal of rehabilitation services after stroke is to improve performance in daily life. Performance, defined by the International Classification of Functioning as what a person actually does outside of the clinic or laboratory,[1,2] is a complex construct and likely influenced by many factors. Following a stroke, the multitude of deficits commonly experienced makes performance in daily life even more restricted. Upper limb (UL) performance, or use, in daily life is no exception. Until recently, it was assumed that improved UL performance was directly linked to improved UL capacity, or what someone is capable of doing on a standardized test inside the clinic or laboratory.[1,2] This assumption is not supported by evidence.[3-6] As a result, there exists an urgent need to explore factors beyond motor function that may impact UL performance in daily life.

Motor sequelae after stroke are well established and receive a considerable amount of attention from the research community[7-9]; psychological/emotional impairment has not received a comparable level of attention. Quantifying psychosocial factors (belief, confidence, and motivation) and self-perceived barriers to performance in daily life is an important step in understanding how these factors may influence UL performance early after stroke. Belief, confidence, and motivation are empirically derived factors from Social Cognitive Theory[10,11] and Social Determination Theory,[12-14] 2 common behavioral theories. An individual's belief in further recovery is considered a positive marker of recovery and is important for treatment adherence and overall stroke recovery.[15-17] An individual's belief and confidence to perform specific tasks can influence activity selection and completion.[18] Indeed, self-efficacy (belief, confidence, and motivation being key

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components of self-efficacy[18]) after stroke mediates walking performance,[19,20] and is associated with physical activity,[21] balance and walking,[20,22] falls,[23-25] independence with activities of daily living,[26,27] onset of poststroke depression,[28] and overall well-being.[29] Confidence is a key component of self-efficacy.[18,30] Individuals with greater confidence in their abilities are more likely to engage in specific activities compared with those with low confidence.[18,31,32] Confidence is often linked to recovery, where increased confidence is a marker of progress, while low levels of confidence may restrict individuals from reaching full recovery potential.[33] Motivation to perform an activity is simultaneously influenced by one's beliefs about one's skills and abilities, the activity goal, the anticipated outcome, and the planned course of action.[10,30,32] Motivation has been identified as a potential target for improving rehabilitation outcomes.[34-36] Both confidence and motivation influence motor learning.[32] Belief, confidence, and motivation are not mutually exclusive factors but rather simultaneously influence each other and influence performance in daily life.

Despite the influence of these factors on other outcomes in persons with stroke, little is known about how belief, confidence, and motivation to use the paretic UL in daily life, and self-perceived barriers to UL recovery evolve over the first 6 months following a stroke. Knowledge of psychosocial factors specific to UL recovery and use in daily life comes from cross-sectional studies of chronic (>6 months) stroke survivors.[15,37-39] While valuable, these data may differ from early stroke recovery, especially in the presence of acute psychological distress that is common after sudden health events such as stroke.[40] Indeed, the rapid motor and functional changes frequently observed early after stroke may influence individual belief, confidence, and motivation to use the paretic UL in daily life differently than in the chronic phase, when the magnitude of change is often smaller. Understanding how these factors might change over the first 6 months after stroke provides critical information for future performance-based UL interventions. Additionally, understanding how self-perceived barriers to UL recovery evolve over the first 6 months may also identify therapy targets to help improve overall UL use in daily life.

The purpose of this exploratory study was to characterize individual belief, confidence, and motivation to use the paretic UL in daily life over the first 24 weeks, or 6 months, after stroke. A secondary purpose was to quantify self-perceived barriers to UL recovery over the same period. As rehabilitation research continues to emphasize performance in daily life, understanding how factors beyond the motor system change over time will provide critical insights into the sequelae of psychosocial factors after stroke. This is a hypothesis-generating study, such that as knowledge of belief, confidence, and motivation early after stroke is acquired, the field can generate testable hypotheses about how these factors interact with and/or could be leveraged to improve outcomes. These data are necessary for the design of future trials that aim to increase performance in daily life. While this report examines these issues in UL performance, the results are important for all domains of stroke rehabilitation.

METHODS

This was a longitudinal, prospective, inception cohort study. Participants were recruited from a large, urban hospital via the Stroke Patient Access Core at Barnes Jewish Hospital in St Louis. Participants were enrolled within 2 weeks of a first-ever stroke, with residual UL paresis. Specifically, participants were included if the following criteria were met: (1) within 2 weeks of a first-ever ischemic or hemorrhagic stroke, confirmed with neuroimaging; (2) presence of UL motor deficits within the first 24 to 48 hours after stroke, as indicated by a National Institutes of Health Stroke Scale (NIHSS) Arm Item score of 1 to 4 or documented manual muscle test grade of less than 5 anywhere on the paretic UL; (3) able to follow a 2-step command, as measured by an NIHSS Command Item score of 0; and (4) anticipated return to independent living, as indicated by the acute stroke team. Participants were excluded from the study if any of the following criteria were met: (1) history of stroke, neurological condition, or psychiatric diagnoses; (2) presence of other comorbid conditions that may limit recovery (eg, end-stage renal disease or stage IV cancer); (3) lives more than 90 minutes from study location; and (4) currently pregnant by self-report. All participants provided written, informed consent and the study was approved by the Human Research Protection Office at Washington University in St Louis, Missouri.

Participants underwent 8 assessment sessions over the first 24 weeks, or 6 months, after stroke. A battery of assessments were administered by the research coordinator at 2, 4, 6, 8, 12, 16, 20, and 24 weeks, with each session lasting approximately 30 to 60 minutes. Due to the observational design, the amount and type of rehabilitation services were not controlled for in this study. Instead, participants received rehabilitation services in accordance with the medical team's recommendations. The study assessments were administered in the research laboratory, inpatient rehabilitation hospitals, skilled nursing facilities, or the participants' homes, depending on location and travel abilities.

Study Assessments

Individual belief, confidence, and motivation to use the paretic UL in everyday tasks and self-perceived barriers to UL recovery were quantified via survey. The survey was developed using focus group data from a large cohort of stroke survivors in Australia and modified for use in the United States (words/phrases unique to Australian culture that could potentially confuse participants were modified).[15,37] Using focus group data ensured the survey items quantified salient survivor concerns as opposed to researchers speculating what issues were most important to survivors. The survey consists of 4 sections: (I) participant estimation of total amount of time spent improving UL function; (II) self-perceived barriers to paretic UL recovery (eg, not enough movement to work with and lack of support from health professionals); and (III) statements about individual belief (I believe further improvement of my [paretic] arm and hand is possible), confidence (I feel confident to do what I need to do to use my [paretic] arm and hand in everyday tasks), and motivation (I want to be able to use my [paretic] arm and hand more in everyday tasks). Participants selected relevant self-perceived barriers from a

list of 13 potential barriers (section II) and all barriers were considered equal (ie, no barrier was considered more or less important than the next). Participants respond to the statements in section III using a 4-point Likert scale (4 = strongly agree, 3 = slightly agree, 2 = slightly disagree, and 1 = strongly disagree). The fourth section (IV), not included in this report, measured participant readiness to change/use the paretic UL in daily activities.

Additional Assessments

Upper limb motor capacity was assessed using the Action Research Arm Test (ARAT).[41] The ARAT is a valid and reliable measure of UL capacity for adults with stroke.[42-44] The ARAT is a 19-item assessment with 4 subscales: grasp, grip, pinch, and gross motor. Scores for the individual items range from 0 to 3, where 0 = cannot complete, 1 = performed partially, 2 = task completed but with abnormal movement, and 3 = performed normally. Individual items are summed and final scores range between 0 and 57, with higher values indicating better UL function.

Cognitive function was screened using the Montreal Cognitive Assessment (MoCA).[45] The MoCA is a valid and reliable cognitive screening tool and is more sensitive in detecting mild cognitive impairment after stroke compared with the Mini-Mental Status Examination.[46-48] The MoCA tests for cognitive impairment across 8 domains (visuospatial/executive functioning, naming, memory, attention, language, abstraction, delayed recall, and orientation), and scores range from 0 to 30, with scores less than 26 indicating cognitive impairment.[45] Depressive symptomatology was examined using the Centers for Epidemiological Studies-Depression Scale (CES-D)[49] that has been validated for use in adults with stroke.[50,51] Scores for the CES-D range from 0 to 60, with higher scores indicative of greater depressive symptomatology. A simple demographics questionnaire collected pertinent demographic information. Lastly, participants self-reported if they were receiving rehabilitation, the setting (eg, inpatient rehabilitation, outpatient, and home health), disciplines (eg, physical therapy, occupational therapy, and speech language pathology), and frequency per week.

Both the psychosocial survey and the CES-D employ standardized scales, wherein the participants choose the appropriate response to each item of the test. For both assessments, the respective scales were printed in large font, laminated, and placed in front of the participant. In effort to reduce information burden, the assessor would read each statement aloud, repeating upon request, and the participant would indicate either verbally or by pointing, their answer to each item. This was repeated for section III of the psychosocial survey and for every item on the CES-D. Reading each item to the participant eliminated the need for reading glasses that were often missing early after stroke and reduced overall fatigue. Participants reported satisfaction with this approach.

Statistical Analysis

All analyses were completed in R (version 3.3.2),[52] an open-source statistical computing program. Descriptive statistics were calculated for belief, confidence, and motivation at each assessment week. The total number of self-perceived barriers was the sum of the total number of barriers identified. The average number of self-perceived barriers per participant and the standard error were calculated for each assessment week. The difference in the total number of self-perceived barriers at weeks 2 and 24 was tested using a paired-samples *t* test.

The relationship between the psychosocial factors (ie, belief, confidence, and motivation), UL capacity (ARAT), depressive symptomatology (CES-D), and cognitive function (MoCA) were analyzed using Spearman rank-order correlation analyses. Correlation analyses were completed at weeks 2, 12, and 24, respectively, and Holm's method was applied to adjust for multiple comparisons. The significant level was established at $\alpha < 0.05$ for all analyses.

RESULTS

Thirty of the 32 enrolled participants had available data for this analysis. The 2 excluded participants were a result of a screen failure and withdrawal prior to the first assessment session. Key participant demographic information is reported in Table 1. Eight participants dropped out of the study between weeks 2 and 24, due to self-selected withdrawal (n = 3), second stroke (n = 1), fatal cancer diagnosis (n = 1), fall resulting in fractured UL (n = 1), and decline in medical status (n = 2). Nearly all participants received rehabilitation services immediately after their stroke (week 2) and services tapered over the study duration. All participants were independent with basic activities of daily living prior to their stroke, and 37% of the sample reported their dominant limb was their paretic limb (ie, concordance). On average, participants had moderate UL paresis (ARAT 22.9 ± 21.4 points) at the week 2 assessment. Two participants presented with near-perfect ARAT scores at the week 2 assessment (55 and 56 points, respectively). Thus, the initial motor deficits observed at enrollment persisted to the week 2 assessment. As expected, paretic UL capacity improved from week 2 (ARAT 22.9 ± 21.4 points) to week 12 (ARAT 41.1 ± 16.2) and week 24 (42.6 ± 15.4).

During the 24-week study, there were high levels of belief, confidence, and motivation across the sample (median value = 4, strongly agree). The percentage of responses using the Likert scale for each assessment session is presented in the Figure. Across all 8 assessment sessions, the large majority of participants strongly agreed that further improvement of their paretic UL was possible (belief), they were confident to use their paretic UL, and were motivated to use their paretic UL in daily life. As seen in the Figure, in the event individuals did not strongly agree to each question, they often slightly agreed, and rarely disagreed to any of the questions, at any point in time.

The average number of barriers for all participants with available data at any time point was 3.4 ± 2.7 at 2 weeks (n = 30), 1.9 ± 2.2 at 12 weeks (n = 22), and 2.2 ± 3.2, at 24 weeks (n = 22). There was not a significant difference in the total number of self-perceived barriers between weeks 2 and 24 ($t = 1.42$, 95% confidence interval = −0.43 to 2.23) for the 22 participants who had available data at both time points. Table 2 lists the 13 possible barriers and the number of participants who answered "yes" to that barrier at weeks 2, 12, and 24. Overall, the top barrier varied across the 3 assessment periods. Nearly all participants indicated limited

Table 1. Participant Demographics[a]

Demographics	Total Sample (N = 30)
Age, y	68.4 ± 9.9
Gender	
Female/male	12/18
Race	
Caucasian	23
African American	6
Asian/Pacific Islander	1
Stroke type, ischemic	30
Stroke location	
Cortical	17
Subcortical	11
Cortical and subcortical	1
Posterior circulation/cerebellar	1
Affected side, left/right	20/10
Concordance, n (%)[b]	11 (37)
Prior working status	
Not working	21
Working at least part-time	9
Independent with ADL prior to stroke, %	100
Living alone prior to stroke, %	20
Self-reported comorbidities, median (range)[c]	2 (0-4)
Receiving rehabilitation services[d], %	
wk 2 (n = 30)	90
wk 4 (n = 27)	78
wk 6 (n = 26)	69
wk 8 (n = 24)	71
wk 12 (n = 22)	55
wk 16 (n = 23)	48
wk 20 (n = 20)	35
wk 24 (n = 22)	23
Admitted to rehabilitation hospital at wk 2, %	83
Days poststroke assessments administered	
wk 2	13.4 ± 2.9
wk 4	27.3 ± 1.9
wk 6	41.6 ± 3.1
wk 8	56.3 ± 2.6
wk 12	84.7 ± 2.9
wk 16	113 ± 4.1
wk 20	140 ± 2.1
wk 24	169 ± 2.7
wk 2 values	
ARAT, mean ± SD (range)[e]	22.9 ± 21.4 (0-56)
MoCA score, median (range)[f]	21 (11-29)
CES-D score, median (range)[g]	7 (0-44)

Abbreviations: ADL, activities of daily living; ARAT, Action Research Arm Test; CES-D, Centers for Epidemiological Studies-Depression Scale; MoCA, Montreal Cognitive Assessment.

[a] Values are mean ± SD, unless otherwise indicated.

[b] Dominant limb = paretic limb.

[c] Median number of comorbidities per participant.

[d] Rehabilitation services include inpatient, outpatient, home health, or skilled nursing.

[e] Scores range from 0 to 57 (higher values = better function); only one participant achieved 56 points on the ARAT.

[f] Scored 0 to 30, lower scores may also reflect fatigue or expressive language deficits.

[g] Scored 0 to 60, with higher scores indicating greater depressive symptomatology.

UL movement as a barrier at week 2, but this did not persist over time. The most common barriers at week 12 were feeling they could not do things correctly when attempting to use the paretic UL in daily life and other, more worrisome health problems. At week 24, the most common barrier was feeling they could not do things correctly when attempting to use the paretic UL in daily life. Collectively, these data indicate that persons with stroke perceive multiple barriers that impeded UL performance in daily life over the first 6 months after stroke. Data from Table 2 are intended to be used directly by researchers designing future studies and by clinicians wanting to probe individual patients about barriers.

There were no relationships between belief, confidence, and motivation and UL capacity, depressive symptomatology, and cognitive function. The correlation coefficients at weeks 2, 12, and 24 are presented in Table 3. After correcting for multiple comparisons using Holm's method, no correlations were significant at any time point.

DISCUSSION

This was the first study of which we are aware to quantify individual belief that further improvement of the paretic UL was possible, and confidence and motivation to use the paretic UL in daily life over the first 24 weeks after stroke. Prior to this study, our limited knowledge of these factors came from cross-sectional data in chronic stroke cohorts.[15,37,38] While data from the chronic cohorts are valuable, the recovery process is noticeably different in the acute phase. Data in this article provide information as to how psychosocial factors present during the time period when rehabilitation services are delivered. These psychosocial factors are inherently dynamic, and are vulnerable to time, experience, and circumstance.[18] The multiple assessment sessions provided the opportunity to quantify the potential variability of these factors across time. The key finding from this study was the high, unwavering levels of belief, confidence, and motivation over the first 24 weeks after stroke. This finding suggests that belief, confidence, and motivation are less variable in the early months after stroke than previously expected.

Belief, confidence, and motivation to act in a given scenario influence actual behavior and activity selection.[10,18,53] Thus, characterizing these factors over the first 24 weeks after stroke, a critical time for recovery, provides novel insight into how these factors may change as individuals improve, plateau, or decline early after stroke. There is a growing emphasis on motivation and other psychosocial/behavioral factors as possible targets for improving UL and stroke outcomes.[34,35] Our data suggest that, early after stroke, improving these psychosocial factors may not be necessary. Instead, developing novel interventions with behavioral components (eg, feedback and incentives) that harness these high levels of belief, confidence, and motivation and promote UL use could be tested to see whether behavioral components help increase overall UL performance in daily life.

Belief that further improvement of the paretic UL is possible appears to be relatively stable over time. Consistent with the findings here early after stroke, 84% of survivors several years after stroke reported belief that further recovery was possible,[37] even though motor recovery has drastically slowed or plateaued at this point.[7,9] Confidence and motivation, however, are strongly influenced by prior success or failure, feedback related to performance, and social models.[18,30,32] In the early months after stroke, individuals experience success with UL tasks, as their motor capacity improves, receive regular feedback from clinicians, and often observe other individuals with stroke successfully complete tasks during rehabilitation sessions (ie, social models). In the chronic recovery phase (≥6 months to years), ongoing or repeated failures to use the UL

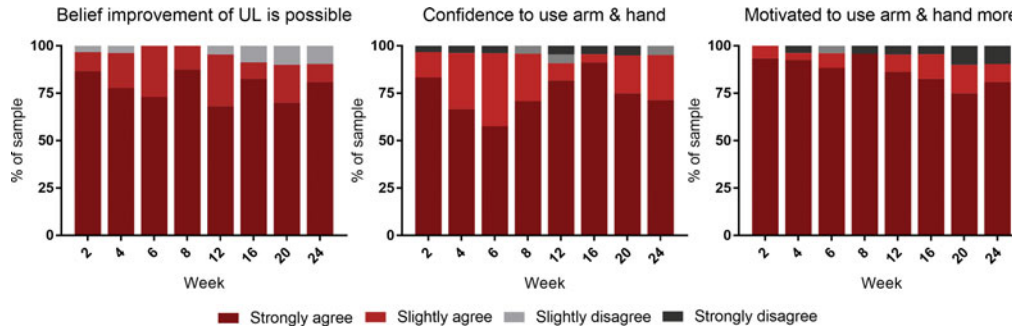

Figure. Percentage of the sample who responded they strongly agreed, slightly agreed, slightly disagreed, or strongly disagreed to the individual statements of belief, confidence, and motivation. The large majority of participants indicated they strongly agreed that further improvement of their paretic UL was possible (belief), and were confident and motivated to use the paretic UL in everyday tasks at every assessment session. UL, upper limb.

Table 2. Self-perceived Barriers to Recovery (Value Represents Number of Participants Who Indicated the Listed Barrier Limited Recovery)[a]

	wk 2 (n = 30)	wk 12 (n = 22)	wk 24 (n = 22)
Not enough movement to work with	22	5	3
Too many other things to deal with	14	1	6
Feeling I cannot do things correctly	14	6	7
Lack of information	9	3	2
Other, more worrisome health problems	8	6	5
Too tired	8	5	5
Feeling what I do does not help	7	3	5
Too many other responsibilities	5	2	5
Lack of money	4	5	4
Difficulty getting out of the house	3	5	4
Lack of support from family/friends	3	0	1
Lack of support from health professionals	2	0	1
Not interested	2	0	1

[a]The barriers are organized by the most common barriers at the week 2 assessment. The potential barriers cover multiple domains (motor, emotional, and social) and no barrier is considered more or less important than the next, regardless of domain.

result in negative feedback, which may reduce confidence or motivation. As time progresses and therapy services fade, individuals with stroke have less opportunity to observe others with stroke succeeding in difficult tasks, which may negatively affect confidence levels. Together, the increasing success coupled with improved UL capacity and access to feedback and social models in the first 24 weeks after stroke may explain, at least in part, the high levels of belief, confidence, and motivation reported in this study. These data suggest rehabilitation services early after stroke have a potentially strong influence on psychosocial factors related to UL recovery. Future research may want to explore how different types of therapy influence belief, confidence, and motivation over the first 24 weeks after stroke.

These data may be applicable to other stroke rehabilitation areas such as walking and balance. Limited longitudinal data exist to explain how belief, confidence, and motivation for balance or walking may change early after stroke. Confidence, for example, may strongly influence walking behavior after stroke due to the fear of falling or other safety concerns that can have significant repercussions (eg, fall resulting in further injury/hospitalization). There are few, if any, substantial

Table 3. Correlation Coefficients at Weeks 2 (n = 30), 12 (n = 22), and 24 (n = 22)

	ARAT[a]			CES-D[b]			MoCA[c]		
	wk 2	wk 12	wk 24	wk 2	wk 12	wk 24	wk 2	wk 12	wk 24
Belief	0.07	−0.03	−0.01	−0.34	−0.29	0.13	−0.04	−0.07	−0.25
Confidence	−0.08	−0.17	0.58	−0.43	−0.04	0.18	0.12	−0.20	−0.05
Motivation	−0.34	−0.41	−0.09	0.03	0.19	0.54	−0.38	−0.18	−0.16

Abbreviations: ARAT, Action Research Arm Test; CES-D, Centers for Epidemiological Studies-Depression Scale; MoCA, Montreal Cognitive Assessment.
[a]Scores range 0 to 57, with higher scores indicating better upper limb function.
[b]Scores range 0 to 60, with higher scores indicating greater depressive symptomatology.
[c]Scores range 0 to 30, with higher scores indicating better cognitive function.

risks to using the paretic UL in daily life. The high levels of individual belief, confidence, and motivation reported here may be partially influenced by the relatively low risks of using the paretic UL in everyday tasks. Because stroke often results in multiple, complex impairments (eg, cognitive, communication, and motor), future work will want to explore belief, confidence, and motivation for other stroke impairments both individually and as a group over time. Belief, confidence, and motivation to use the paretic UL may change when contextualized with other impairments (eg, motivation to use the paretic UL may be reduced or heightened by concurrent motivation to improve communication or resume walking).

Results from the correlation analyses show belief, confidence, and motivation are not associated with UL capacity, depressive symptomatology, and cognition in this sample. This is important for future UL performance research. The common clinical domains tested here (capacity, depressive symptomatology, and cognition) appear less influential with psychosocial factors compared to other aspects of stroke recovery (eg, walking and self-management). Belief, confidence, and motivation may be influenced by other, less common factors such as self-regulation,[10,14] perceived competence and control,[14,53] and environmental/social factors.[10] Future research may want to explore these factors, as they relate to belief, confidence, and motivation.

Limitations

Several limitations influence the interpretation of these data. The small sample size limits the generalizability of these results and the ability to infer definitive conclusions; a larger study is currently underway to validate these findings. Nearly all participants in this sample improved their UL capacity over the study duration, which may have contributed to the high levels of belief, confidence, and motivation. Additionally, these psychosocial factors may be influenced by the amount, or dose, of movement practice[54] and future studies may want to explore this potential relationship. As expected in the 24 weeks following a stroke, some participants withdrew from the study prior to completing all 8 assessment sessions. While it is possible that these participants could have later reported low levels of belief, confidence, and motivation, they were reporting high levels at the time points just before they dropped out. Additionally, and most importantly, belief, confidence, and motivation are complex constructs. In this study, we did not query every possible dimension of these constructs (eg, intrinsic vs. extrinsic motivation). Future work may want to explore each construct in greater detail to provide a more robust understanding of what components may be most affected in the recovery process or utilize qualitative methods to develop a deeper understanding of these constructs in this population. Currently, there is a lack of UL-specific assessments to quantify these factors (eg, no UL-specific self-efficacy scale). It may be worthwhile to develop an UL-specific self-efficacy scale for future work given that self-efficacy is task-specific and varies across circumstances.[55,56]

CONCLUSIONS

Just as there are recovery and disability trajectories,[57,58] there is also a recovery trajectory of psychosocial factors that can change as a result of biological, personal, and environmental factors. The initial 24 weeks after stroke often includes rapid, notable improvement in physical function, transitions between medical facilities and home, and attempts to return to prestroke routines and life roles. An individual's belief, confidence, and motivation to use the paretic UL in everyday tasks are generally high and may be less vulnerable early after stroke to one's changing functional status and environment. As a result, future studies to test UL interventions may consider focusing more on reducing self-perceived barriers and other novel techniques that harness the high levels of confidence and motivation to increase UL use in everyday tasks. Devoting time and resources to characterizing these psychosocial factors for other stroke-related deficits is a worthwhile endeavor, as belief, confidence, and motivation likely vary across different impairments (eg, balance and language). This work will ultimately lead to more robust, multidimensional interventions that may help improve outcomes after stroke.

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