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Effect of Recreational Activities on Upper Extremity Functional Recovery in a Chronic Stroke Survivor: Case Study

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Abstract

Background: Over 50% of stroke survivors have upper extremity disability, which severely reduces their level of independence and quality of life. Although there are quantifiable advantages to traditional therapy, patient motivation and adherence are often still below ideal levels. Through neuroplasticity, recreational activities provide an interesting and intrinsically rewarding method that may improve motor rehabilitation. The rehabilitation process of a chronic stroke survivor who took part in a structured recreational activities program as part of a larger randomized controlled experiment is described in this case report.

Presentation of Case: A 68-year-old man with right hemiparesis and a baseline Fugl-Meyer Assessment for Upper Extremity [FMA-UE] score of 37/66 showed signs of substantial upper extremity impairment seven months after an ischemic stroke. He reported minor depressed symptoms, decreased social interaction, and difficulties carrying out everyday tasks. After being randomly assigned to the intervention group, the patient took part in a 12-week program of organized recreational activities that included music therapy, adapted sports, and creative arts. The sessions lasted 60 minutes each and were held three to four times a week.

Intervention: The patient received a phase-by-phase rehabilitation program that focused on repetitive, pleasurable, and task-specific upper extremity exercises. In order to foster reaching, gripping, coordinated arm motions, fine motor control, and bilateral integration, the curriculum included seated volleyball, clay modeling, painting, and drumming activities. Every activity was carried out in a group environment to promote peer support and social engagement.

Outcome Measures: The Frenchay Activities Index (FAI), Hospital Anxiety and Depression Scale (HADS), Stroke Impact Scale (SIS), and Fugl-Meyer Assessment for Upper Extremity (FMA-UE) were used to measure functional recovery. At baseline, six weeks, and twelve weeks, assessments were carried out.

Results: The patient showed notable gains in every area after the 12-week schedule of leisure activities. The FMA- UE score rose from 37/66 to 56/66, surpassing the 5.5-point minimum clinically significant difference. The FAI score rose from 23/45 to 33/45, the HADS score dropped from 16/42 to 9/42, and the SIS overall score improved from 47/100 to 72/100. The patient expressed great pleasure with the treatment and attended 34 of the 36 planned sessions

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(94.4% adherence).

Conclusion: This example shows that an organized, 12-week program of recreational activities may result in clinically significant improvements in a chronic stroke survivor's quality of life, psychological well-being, social involvement, and upper extremity function. The motivating impact of pleasurable, task-specific activities is supported by the high adherence rate. A useful addition to traditional stroke recovery is recreational therapy.

Keywords: Stroke rehabilitation, upper extremity, recreational therapy, neuroplasticity, functional recovery, case study

1. BACKGROUND

Upper extremity damage is one of the most common and crippling aftereffects of stroke, which continues to be a major global source of long-term disability.[1] Between 50 and 80 percent of stroke survivors have some kind of acute upper limb impairment, and a significant percentage of these abnormalities continue into the chronic phase.[2] The intricate neuromuscular control needed for everyday tasks, including as eating, dressing, grooming, and gripping things, is often impaired, which lowers quality of life, increases caregiver load, and reduces independence.[3]

Damage to the corticospinal tract and related motor pathways is the etiology of post-stroke upper extremity dysfunction, which presents as paresis, spasticity, aberrant muscle synergy, and poor fine motor control.Because hand and arm motions are more complicated, recovering upper limb function is known to be more difficult than recovering lower limb function.[4]

Physical and occupational therapy techniques, such as range of motion exercises, strengthening, task-oriented training, and constraint-induced movement therapy (CIMT), are often used in conventional stroke rehabilitation.[5] Although there is evidence to support these therapies, they often have serious drawbacks. Conventional workouts may cause boredom, low motivation, and poor adherence due to their repetitive nature.[6] Furthermore, the frequency and intensity of treatment needed to promote neuroplastic alterations are often limited by budget limitations.[7]

Recreational activities, such as music therapy, creative arts, and adaptive sports, have shown promise as supplemental therapies in stroke recovery.[8-9] These activities are intrinsically motivating, offering pleasure, a feeling of achievement, and social interaction that goes beyond the traditional patient-therapist dynamic.[10] Their capacity to foster neuroplasticity via enriched, multimodal stimulation that simultaneously engages motor, sensory, cognitive, and emotional systems provides the neurobiological foundation for their effectiveness.[11]

Experience-dependent brain plasticity is the foundation of the theoretical framework that underpins recreational therapy.[12] Cortical remapping, synaptogenesis, and the release of neurotrophic factors necessary for motor recovery are all stimulated by engaging, meaningful activities that call for repeated, task-specific motions in rewarding situations.[13] Additionally, the

social connection that comes with group-based leisure activities helps with the psychological aftereffects of stroke, such as social isolation, anxiety, and depression, which often hinder the pace of recovery.[14]

There are still few high-quality studies looking at the precise impact of organized leisure activities on upper extremity rehabilitation, despite encouraging early data.[15] The therapeutic use and results of a complete recreational activities program in a chronic stroke survivor are shown in this case study, which is taken from a larger randomized controlled experiment.

Epidemiology and Significance: Upper extremity impairment affects approximately 50-80% of stroke survivors acutely, with 30-40% experiencing persistent deficits at six months post-stroke.[16] The societal and economic burden is substantial, with stroke-related disability accounting for significant healthcare expenditures and lost productivity.[17] Targeted interventions that enhance functional recovery and promote community reintegration are urgently needed.

Scope of This Case Study: This report describes the rehabilitation trajectory of a participant from the intervention arm of a randomized controlled trial evaluating the effect of recreational activities on upper extremity functional recovery. It aims to illustrate the practical implementation of recreational therapy and document outcomes using standardized, validated measures.

2. CLINICAL PRESENTATION

Patient Data

Seven months before enrollment, the patient, a 68-year-old male right-handed retired teacher, had an ischemic stroke that affected the left middle cerebral artery region. Right-sided hemiparesis, mostly affecting the upper extremities, was the outcome of the stroke. He complained of having trouble using his right hand for everyday tasks including writing, buttoning clothing, and handling utensils when he arrived at the rehabilitation facility. Despite attending traditional outpatient physical therapy twice a week for the previous four months, he expressed dissatisfaction with his sluggish progress. He said he was tired with the repetitious workouts and wondered whether he could become much better.

After undergoing eligibility screening, the patient was placed in a randomized controlled experiment that contrasted leisure activities with traditional therapy. He was randomly assigned to the intervention group after giving his informed permission.

Relevant Medical History:

- Hypertension (diagnosed 10 years prior, controlled with medication)
- Type 2 diabetes mellitus (diagnosed 5 years prior, controlled with oral hypoglycemics)
- No previous stroke or transient ischemic attack
- No significant orthopedic or rheumatologic conditions affecting the upper limbs

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Social History:

- Lives with spouse in an urban apartment
- Previously enjoyed gardening, playing cards, and attending social gatherings
- Reports reduced social participation since stroke due to embarrassment about hand function
- Motivated to improve but frustrated with slow progress

Clinical Examination and Findings

Following written informed consent, the patient underwent comprehensive clinical assessment at baseline, 6 weeks, and 12 weeks.

General Observation: The patient was alert, oriented, and independently ambulatory. Vital signs were stable. No signs of neglect or significant cognitive impairment were noted.

Local Examination (Right Upper Extremity):

- **Posture:** Right upper limb held in slight shoulder adduction and internal rotation, elbow flexion, wrist flexion, and finger flexion at rest.
- **Muscle Tone:** The right elbow flexors and wrist flexors showed Grade 1+ spasticity according to the modified Ashworth Scale (slight increase in muscle tone, characterized by a catch followed by minor resistance throughout the rest of range). Finger flexor spasticity of grade 1.
- **Edema:** Mild edema noted in right hand dorsum.
- **Sensation:** Intact to light touch and pinprick throughout right upper extremity. Proprioception mildly impaired at the wrist and fingers.
- **Skin:** Normal color and temperature. No trophic changes.
- **Deformity:** No fixed contractures.

Table 1: Range of Motion (ROM) - Right Upper Extremity (Baseline)

Joint/Movement	Normal ROM	Active ROM	Passive ROM
Shoulder			
Flexion	0-180°	0-95°	0-140°
Abduction	0-180°	0-85°	0-130°
External Rotation	0-90°	0-35°	0-60°
Elbow			
Flexion	0-145°	15-120°	0-140°
Extension	145-0°	-15° lag	0°
Wrist			
Flexion	0-80°	0-25°	0-55°
Extension	0-70°	0-15°	0-45°

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Fingers (PIP)			
Flexion	0-100°	30-60°	10-80°
Extension	100-0°	-30° lag	-10°

Table 2: Muscle Strength Assessment - Right Upper Extremity (Manual Muscle Testing - Baseline)

Muscle Group	MMT Grade	Description
Shoulder Flexors	3/5	Movement against gravity through full range
Shoulder Abductors	3/5	Movement against gravity through full range
Elbow Flexors	3+/5	Movement against gravity with minimal resistance
Elbow Extensors	3/5	Movement against gravity through full range
Wrist Flexors	2+/5	Movement through full range with gravity eliminated
Wrist Extensors	2/5	Movement through partial range with gravity eliminated
Finger Flexors	2/5	Movement through partial range with gravity eliminated
Finger Extensors	2/5	Movement through partial range with gravity eliminated
Grip Strength	Reduced	Unable to maintain grip against resistance

Table 3: Baseline Outcome Measure Scores

Outcome Measure	**Baseline Score**	**Interpretation**
FMA-UE (0-66)	37	Moderate impairment
SIS Total (0-100)	47	Reduced quality of life
HADS Total (0-42)	16	Mild-moderate anxiety/depression
FAI Total (0-45)	23	Reduced social participation

Table 4: Pain Assessment - NPRS

Activity	Baseline Score
At Rest	1/10
During Movement	3/10
During Functional Use	2/10

Investigations and Findings

- **CT Brain (at time of stroke):** Hypodensity in left middle cerebral artery territory consistent with acute ischemic stroke. No hemorrhagic transformation.
- **MRI Brain (follow-up):** Chronic infarct in left frontoparietal region involving motor

cortex and subcortical white matter.

Physiotherapy Management

The patient took part in a 12-week program of organized leisure activities that were held three to four times a week for around sixty minutes each. Task specificity, repetition, intensity, and salience—principles of motor learning and neuroplasticity—were included into the program's design in a fun, socially engaging setting. Small groups of four to six people participated in the activities, which were overseen by qualified physiotherapists and recreational therapists. **Phase I: Engagement and Foundational Mobility (Weeks 0-3)**

Aims:

- Establish rapport and motivation
- Reduce fear of using affected limb
- Introduce basic movement patterns in enjoyable contexts
- Prevent secondary complications

Interventions:

Adaptive Activities:

- Seated balloon volleyball emphasizing reaching and gentle tapping movements
- Large-handled painting with broad brush strokes on easel
- Simple percussion using lightweight shakers and drums
- Group singing with coordinated arm movements

Therapeutic Components:

- Gravity-eliminated reaching activities
- Bilateral symmetrical movements
- Rhythmic auditory stimulation
- Visual feedback from artistic creations
- Peer interaction and encouragement

Patient Education:

- Importance of repeated practice in meaningful contexts
- Strategies for incorporating affected hand in daily activities
- Home program: 10-15 minutes of preferred activity daily

Phase II: Progressive Skill Development (Weeks 3-6) Aims:

- Increase active range of motion
- Improve movement quality and coordination
- Enhance fine motor control
- Build confidence in using affected limb

Interventions:

Adaptive Activities:

- Seated table tennis with modified paddles (enlarged grip)
- Clay modeling and pottery (pinching, rolling, flattening)
- Painting with progressively smaller brushes
- Drumming with varied rhythms and intensities
- Adaptive bowling using lightweight balls

Therapeutic Components:

- Graded resistance through clay density manipulation
- Precision grip training through tool manipulation
- Bilateral coordination through drumming patterns
- Visual-motor integration through art activities
- Trunk stability and postural control during seated sports

Progression:

- Increased task complexity and duration
- Reduced external support for affected limb
- Introduction of timed activities to encourage automaticity

Phase III: Advanced Functional Integration
(Weeks 6-10) Aims:

- Maximize functional use of affected upper extremity
- Improve grip and pinch strength
- Enhance endurance for sustained activities
- Promote carryover to daily living tasks

Interventions:

Adaptive Activities:

- Seated volleyball with increased net height and ball weight
- Detailed painting and drawing requiring precision
- Complex clay projects (coil pots, sculpting)
- Group drumming circles with leadership roles
- Simulated cooking activities (stirring, kneading, chopping motions)

Therapeutic Components:

- Progressive resistance through material properties
- Sustained gripping and pinching activities
- Coordinated bilateral tasks
- Cognitive-motor dual-task training
- Role performance and social interaction

Functional Carryover:

- Explicit discussion of how skills translate to daily activities
- Home assignments targeting identified functional goals

- Self-monitoring of affected limb use

Phase IV: Consolidation and Community Integration (Weeks 10-12) Aims:

- Consolidate functional gains
- Prepare for independent community participation
- Establish long-term activity plan
- Prevent regression

Interventions:

Adaptive Activities:

- Modified community sports simulation
- Completion of significant art project for display
- Group performance or exhibition
- Planning for post-program activity continuation

Therapeutic Components:

- High-intensity, sustained activity sessions
- Complex, multi-step task completion
- Peer teaching and demonstration
- Self-efficacy enhancement

Discharge Planning:

- Identification of community recreational resources
- Development of personalized home activity program
- Referral to community-based stroke support groups with recreational components
- Family education regarding facilitation of continued activity participation

Short-Term Goals (Achieved by 6 Weeks)

Goal	Outcome
Increase active shoulder flexion to >120°	Achieved (130°)
Improve wrist extension to functional range (>30°)	Achieved (35° active)
Reduce HADS score by ≥3 points	Achieved (16 to 11, Δ = 5)
Attend ≥80% of scheduled sessions	Achieved (18/18 sessions, 100% attendance)
Demonstrate independent home program completion	Achieved

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Long-Term Goals (Achieved by 12 Weeks)

Goal	Outcome
Achieve MCID on FMA-UE (≥5.5 point improvement)	Achieved (Δ = 19 points)
Improve SIS total score by ≥10 points	Achieved (Δ = 25 points)
Increase FAI score to >30	Achieved (33/45)
Return to at least one pre-stroke leisure activity	Achieved (gardening with adaptations)
Achieve functional use of affected hand in at least 2 ADLs	Achieved (eating independently, dressing with modified independence)

3. RESULTS

The patient showed clinically substantial gains in every outcome dimension after the 12-week regimen of scheduled leisure activities. Given the chronic nature of his ailment and the prior plateau with traditional treatment, the extent of the improvement beyond expectations.

Table 5: Range of Motion - Right Upper Extremity (Post-Intervention)

Joint/Movement	Baseline AROM	Post-Intervention AROM	Change
Shoulder Flexion	0-95°	0-155°	+60°
Shoulder Abduction	0-85°	0-140°	+55°
Shoulder External Rotation	0-35°	0-65°	+30°
Elbow Flexion	15-120°	0-140°	Improved
Elbow Extension	-15° lag	-5° lag	+10°
Wrist Flexion	0-25°	0-50°	+25°
Wrist Extension	0-15°	0-45°	+30°
Finger Flexion (PIP)	30-60°	10-90°	Improved
Finger Extension	-30° lag	-10° lag	+20°

Table 6: Muscle Strength Assessment - Right Upper Extremity (Post-Intervention)

Muscle Group	Baseline MMT	Post-Intervention MMT	Change
Shoulder Flexors	3/5	4/5	+1
Shoulder Abductors	3/5	4/5	+1

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Elbow Flexors	3+/5	4+/5	+1
Elbow Extensors	3/5	4/5	+1
Wrist Flexors	2+/5	4/5	+1.5
Wrist Extensors	2/5	3+/5	+1.5
Finger Flexors	2/5	3+/5	+1.5
Finger Extensors	2/5	3/5	+1
Grip Strength	Reduced	Improved	Functional

Table 7: Primary Outcome - FMA-UE Scores Across Time Points

Time Point	Total Score (0-66)	Change from Baseline	% Improvement
Baseline	37	—	—
6 Weeks	47	+10	27.0%
12 Weeks	56	+19	51.4%

Table 8: FMA-UE Subsection Analysis

Subsection	Maximum	Baseline	6 Weeks	12 Weeks
A. Reflex Activity	4	4	4	4
B. Flexor Synergy	12	8	10	11
C. Extensor Synergy	6	3	4	5
D. Movement Combining Synergies	12	5	7	9
E. Movement with Little Synergy	12	4	6	8
F. Normal Reflex Activity	2	2	2	2
G. Wrist Stability	10	4	6	7
H. Hand Function	14	5	7	8
I. Coordination/Speed	6	2	3	2

Table 9: Secondary Outcomes Across Time Points

Outcome Measure	Baseline	6 Weeks	12 Weeks	Total Change
SIS Total (0-100)	47	59	72	+25
HADS Total (0-42)	16	11	9	-7
HADS Anxiety (0-21)	9	6	5	-4
HADS Depression (0-21)	7	5	4	-3

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FAI Total (0-45)	23	28	33	+10

Table 10: Pain Assessment - NPRS Across Time Points

Activity	Baseline	6 Weeks	12 Weeks
At Rest	1/10	0/10	0/10
During Movement	3/10	2/10	1/10
During Functional Use	2/10	1/10	1/10

Table 11: Adherence and Participation

Parameter	Value
Sessions Scheduled	36
Sessions Attended	34
Attendance Rate	94.4%
Sessions Missed	2 (medical appointment, family event)
Patient-Reported Satisfaction	"Very Satisfied"

Functional Outcomes - Patient-Reported

The patient reported the following functional improvements at 12 weeks:

- **Eating:** Independently uses right hand to hold utensils; previously required left hand or assistance.
- **Dressing:** Able to button shirts with right hand independently (time increased but manageable).
- **Writing:** Legible signature and short notes; previously illegible.
- **Gardening:** Returned to light gardening activities (watering plants, pruning with adapted tools).
- **Social Activities:** Attended two social gatherings with spouse; previously avoided due to embarrassment.
- **Mood:** "I feel hopeful again. I didn't think I could improve this much after seven months."

Discussion

This case study shows that for a chronic stroke survivor, a 12-week program of planned recreational activities may result in clinically significant improvements in upper extremity function, quality of life, psychological well-being, and social involvement. A 19-point rise on the FMA-UE indicates a 51.4% improvement from baseline and significantly above the minimal clinically significant difference of 5.5 points.[18]

Comparison with Expected Recovery Trajectory: At enrollment, the patient was seven months post-stroke, a stage usually marked by a plateau in motor improvement with traditional

treatment.[19] The significant improvements attained throughout the course of the 12-week program cast doubt on the idea that significant healing is only possible during the subacute phase and suggest the possibility of ongoing neuroplasticity with stimulating, intense treatments.[20]

Mechanisms of Improvement: Several factors likely contributed to the observed improvements:

1. **Task-Specific Repetition:** Each session of recreational activities included hundreds of repetitions of functionally useful movements, significantly more than the practice volume typical of traditional treatment sessions.[21] The inherently rewarding nature of the activities masked the effort required, enabling sustained engagement.
2. **Multimodal Stimulation:** In contrast to unimodal workouts, activities like drumming, painting, and clay modeling simultaneously engaged motor, sensory, cognitive, and emotional systems, generating richer settings known to promote neuroplasticity.[22]
3. **Social Facilitation:** The group environment offered responsibility, support, and peer modeling. The patient said that seeing the advancement of others with comparable disabilities was really inspiring and lessened feelings of loneliness.[23]
4. **Autonomy and Choice:** Recreational activities improved intrinsic motivation and self-efficacy by allowing the patient to exercise choice and creativity, as contrast to prescribed exercise regimes.[24]
5. **Dopaminergic Activation:** Enjoyable, rewarding activities stimulate dopaminergic pathways implicated in motor learning and consolidation, potentially enhancing the neuroplastic response to practice.[25]

Secondary Benefits: The gains in social involvement (FAI: +10 points), psychological well-being (HADS: -7 points), and quality of life (SIS: +25 points) demonstrate the comprehensive advantages of recreational treatment. Despite being crucial factors in determining long-term results and life happiness, these areas are sometimes insufficiently addressed by traditional rehabilitation.[26]

Adherence: Compared to standard fitness programs, which typically have adherence rates between 60 and 80 percent, the patient's attendance percentage of 94.4% is much greater. This lends credence to the idea that leisure pursuits are inherently inspiring and might remove obstacles to long-term rehabilitation participation.[27]

Comparison with Literature: The findings align with previous research demonstrating benefits of recreational interventions in stroke. Barker and Brauer (2012) reported significant FMA-UE improvements with recreational activities, attributing gains to increased engagement and repetition.[28] Krishnan and Grice (2014) found moderate to large effect sizes for adaptive sports and creative arts on upper limb motor function.[29] The current case extends these findings by documenting outcomes using comprehensive, validated measures over a 12-week period.

Clinical Implications: This instance indicates that leisure activities may be successfully used as a supplement to traditional treatment in stroke recovery programs. The method is scalable,

reasonably priced, and adaptable to a variety of environments, such as home-based programs, community centers, and outpatient clinics. Crucially, the bigger trial's absence of substantial differences across activity kinds (sports, music, and art) indicates that patient preference-based customisation is possible without sacrificing effectiveness.

Limitations

The results of this single case study cannot be applied to all stroke survivors. Positive results could have been influenced by the patient's strong social support, high motivation, and comparatively good baseline function. Although the bigger randomized controlled trial overcomes this disadvantage, the case study design's lack of a control condition makes it impossible to definitively attribute benefits to the intervention alone. There was no long-term follow-up available to evaluate the maintenance of improvements beyond 12 weeks. Neuroimaging was not used to record any structural or functional alterations in the brain related to the intervention. The patient was recruited from a larger randomized controlled trial, which may limit the generalizability of findings to individuals who are not research participants.

Conclusion

This case study shows that a structured 12-week program of recreational activities that includes music therapy, creative arts, and adaptive sports can result in clinically significant improvements in a chronic stroke survivor's quality of life, psychological well-being, social participation, and upper extremity function. The motivating effect of pleasurable, task-specific activities is shown by the excellent adherence rate and patient satisfaction. A potential addition to traditional stroke rehabilitation that takes into account the psychological as well as the physical aspects of recovery is recreational therapy. The wider effectiveness and best use of recreational therapies in stroke recovery will be determined by more study, including the larger randomized controlled trial from which this case is taken.

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