

# Sensorimotor training with movement representation techniques for rotator cuff-related shoulder pain: a feasibility study

Fan Bin<sup>1</sup>; Ho Chung Yee Cecilia<sup>1</sup>; Huang Frank Fan<sup>1</sup>; Hsu Chun Liang<sup>1</sup>; Wong Yu Lok Arnold<sup>1,2</sup>; **Leong Hio Teng**<sup>1,2\*</sup>

<sup>1</sup> Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

<sup>2</sup> Research Institute for Smart Ageing, The Hong Kong Polytechnic University, Hong Kong, China

## Introduction

Rotator cuff-related shoulder pain (RCRSP) is the most common shoulder disorder that contributes to persistent pain and functional impairments. Traditional management focused on peripheral structural dysfunctions;<sup>1</sup> however, emerging evidence suggests central mechanisms play a critical role in the persistence of shoulder pain.<sup>2,3</sup> **Sensorimotor training with movement representation techniques (ST-MRT) incorporates both peripheral and central mechanisms.** This study aimed to evaluate the feasibility of a 12-weeks ST-MTR intervention in individuals with RCRSP.

## Methods

- **Study design:** A feasibility study
- **Participants:** Twenty-seven participants (mean age = 67.2 ± 6.5 years) with RCRSP
- **Interventions:** 12-weeks of ST-MRT vs. control (standard care)
- **Feasibility outcomes:** attrition rate, intervention adherence rates, satisfaction rates, Self-perceived pain and pain-related disability using Shoulder Pain and Disability Index (SPADI)

## Results

- Of the 27 participants, 24 completed both the baseline and post-intervention assessments.
- Attrition rates were 13.3% (ST-MRT) and 8.3% (control). The intervention adherence rate was 99.4%, and the satisfaction rate was 100%. No adverse events were reported.
- A significant time × group interaction was observed for pain intensity ( $p=0.010$ ). The ST-MRT group showed a significant reduction in SPADI pain scores (baseline = 51.2±26.2% vs. post-intervention = 16.6±17.2%,  $p<0.001$ ), while the control group showed no significant change ( $p=0.615$ ).

## Conclusion

Our findings indicate that it is feasible to conduct a full-scale RCT to evaluate the effectiveness of ST-MRT in individuals with RCRSP.

### References:

1. Doiron-Cadrin P, Lafrance S, Saulnier M, et al. Shoulder Rotator Cuff Disorders: A Systematic Review of Clinical Practice Guidelines and Semantic Analyses of Recommendations. Arch Phys Med Rehabil 2020;101(7):1233-1242.
2. Bachasson D, Singh A, Shah SB, et al. The role of the peripheral and central nervous systems in rotator cuff disease. J Shoulder Elbow Surg 2015; 24(8),1322-1335.
3. Ngomo S, Mercier C, Bouyer LJ, et al. Alterations in central motor representation increase over time in individuals with rotator cuff tendinopathy. Clin Neurophysiol 2015; 126: 365–371.

### Sensorimotor training with movement representation techniques (ST-MRT)



Phases	Description																																			
<b>1. Action Observation Training</b>	Observe videos of a model who performed the exercise.																																			
<b>2. Mirror Therapy</b>	Perform the exercise with the unaffected side, with reflective side facing the uninvolved side and the affected side placed behind the mirror.																																			
<b>3. Sensorimotor training</b>	Perform the exercise with the affected side, with the following steps for retraining of shoulder control:																																			
	<table border="1"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td><b>Phase 1<sup>a</sup></b></td> <td>Passive shoulder elevation</td> <td>Final position actively holds for 5 seconds</td> <td>Active return, with manual feedback if needed</td> <td>Active return, with verbal feedback</td> </tr> <tr> <td><b>Phase 2<sup>a</sup></b></td> <td>Active assisted elevation<sup>b</sup></td> <td>Final position actively holds for 5 seconds</td> <td>Active return, with manual feedback if needed</td> <td>Active return, with verbal feedback</td> </tr> <tr> <td><b>Phase 3<sup>a</sup></b></td> <td>Active shoulder elevation, with manual feedback if needed</td> <td>Final position actively holds for 5 seconds</td> <td>Active return, with manual feedback if needed</td> <td>Active return, with verbal feedback</td> </tr> <tr> <td><b>Phase 4<sup>a</sup></b></td> <td colspan="4">Active shoulder flexion, without manual feedback</td> </tr> <tr> <td><b>Phase 5</b></td> <td colspan="4">Active shoulder flexion, without visual feedback</td> </tr> <tr> <td><b>Phase 6</b></td> <td colspan="4">Active shoulder flexion, perform faster, then progressed with a load</td> </tr> </tbody> </table>		1	2	3	4	<b>Phase 1<sup>a</sup></b>	Passive shoulder elevation	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback	<b>Phase 2<sup>a</sup></b>	Active assisted elevation <sup>b</sup>	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback	<b>Phase 3<sup>a</sup></b>	Active shoulder elevation, with manual feedback if needed	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback	<b>Phase 4<sup>a</sup></b>	Active shoulder flexion, without manual feedback				<b>Phase 5</b>	Active shoulder flexion, without visual feedback				<b>Phase 6</b>	Active shoulder flexion, perform faster, then progressed with a load			
	1	2	3	4																																
<b>Phase 1<sup>a</sup></b>	Passive shoulder elevation	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback																																
<b>Phase 2<sup>a</sup></b>	Active assisted elevation <sup>b</sup>	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback																																
<b>Phase 3<sup>a</sup></b>	Active shoulder elevation, with manual feedback if needed	Final position actively holds for 5 seconds	Active return, with manual feedback if needed	Active return, with verbal feedback																																
<b>Phase 4<sup>a</sup></b>	Active shoulder flexion, without manual feedback																																			
<b>Phase 5</b>	Active shoulder flexion, without visual feedback																																			
<b>Phase 6</b>	Active shoulder flexion, perform faster, then progressed with a load																																			

<sup>a</sup> In front of mirror

<sup>b</sup> Movement assisted by the physiotherapist

