

How is **proprioception** assessed and addressed in upper limb (UL) musculoskeletal (MSK) conditions by Occupational Therapists (OTs) in Singapore?

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Background

Proprioception is the continuous feedback to central nervous system about the body's position and movement in space without relying on external visual cues (Hagert, 2010)

Deficits in proprioception disrupts muscle control and voluntary actions (Sidarta et al., 2022; Valdes & Rider, 2024), negatively impact grip strength, dexterity and daily use of affected upper limb (Rand, 2018)

Existing Gaps

1) Literature on Proprioception

- Extensive in Neurorehabilitation & Physiotherapy (Hillier et al., 2015; Sidarta et al., 2022)
- Few articles based on UL MSK rehabilitation (Chen, 2021; Hagert & Rein, 2024; Valdes & Rider, 2024)

2) Varied Definition of Proprioception

(Valdes et al., 2023)

Proprioception is defined as one's **awareness of their body's position and movement through space**

(Hincapie et al., 2016)

Proprioception as 3 submodalities: kinesthesia, joint position sense and **sense of force or resistance**

(Hagert & Persson, 2010)

Proprioception is defined as **sensory perception** and **motor control** contributing to posture, balance, coordination and joint stability

Some also argued that it is appropriate to interpret **proprioception and kinesthesia as synonymous** (Han et al., 2016)

Research Aims

- 1 Explore **definitions & importance** of proprioception amongst OTs
- 2 Examine **current practices** in proprioceptive **assessments & interventions**
- 3 Identify **facilitators & barriers** affecting proprioceptive assessments & interventions

Methodology

Qualitative Descriptive (Sandelowski, 2000) with semi-structured individual interviews conducted

Content and thematic analysis was used

Results

Participant demographic

Years of experience		Area of practice		Setting of practice	
<5 years	13	UL MSK	11	Public	16
≥ 5 years	4	Others	6	Private	1

Conditions involving proprioceptive management

N=17

Ligament Injuries	14
Fractures	6
Joint Laxity	4
Nerve Injuries	4
Shoulder Injuries	2
Osteoarthritis	2

Reported definitions of proprioception

All participants commonly defined proprioception as joint position sense

Some **distinct** “proprioception” from “kinesthesia” while some consider them to be **synonymous**

Some perceive proprioception as **sensory perception** and **motor control**

Top 3 reported assessment (Ax) & intervention (Tx)

N=17

Ax	Joint Position Reproduction	16
	Assessing Movement Patterns	13
	Client Self-Reports	8
Tx	Training Reactive Muscle Control	15
	Occupation-Based Interventions	13
	Strengthening Exercises	11

Training Reactive Muscle Control (n=15)



Occupation-Based Interventions (n=13)



Strengthening Exercises (n=11)



Proprioceptive practices

Facilitators

(1) Co-worker influence

- “Co-workers are the best influence on the decision of proprioceptive intervention and treatments... (P11)”

(2) Availability of equipment

- “...Stuff that I have in the clinic is sufficient enough for me to conduct and carry out a proprioceptive assessment or intervention... (P03)”

(3) Self-directed learning

- “Online forums... for hand therapists share certain videos about what they tried... and whether it worked or not... Yeah, so that’s the only other way that I am trying to learn. (P01)”

Barriers

(1) Limited empirical evidence and consensus in current literature

- “The literature is really quite, not very strong... there’s not a lot of RCTs that are strong enough to prove like why this is like effective... (P13)”
- “There are Delphi studies for... other complex hand topics but... there’s none for [proprioception] yet... there is no consensus amongst experts... (P05)”

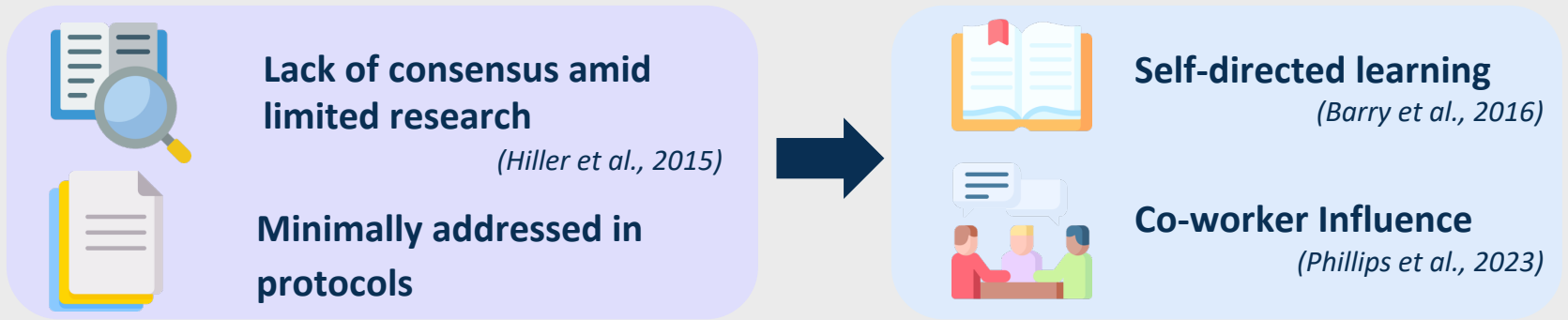
(2) Proprioception minimally addressed in protocols

- “From what I remember, I think even if the fractures one have protocol, it will just say proprio training, but not what is done in the proprio. (P15)”

Discussion & Key Takeaways

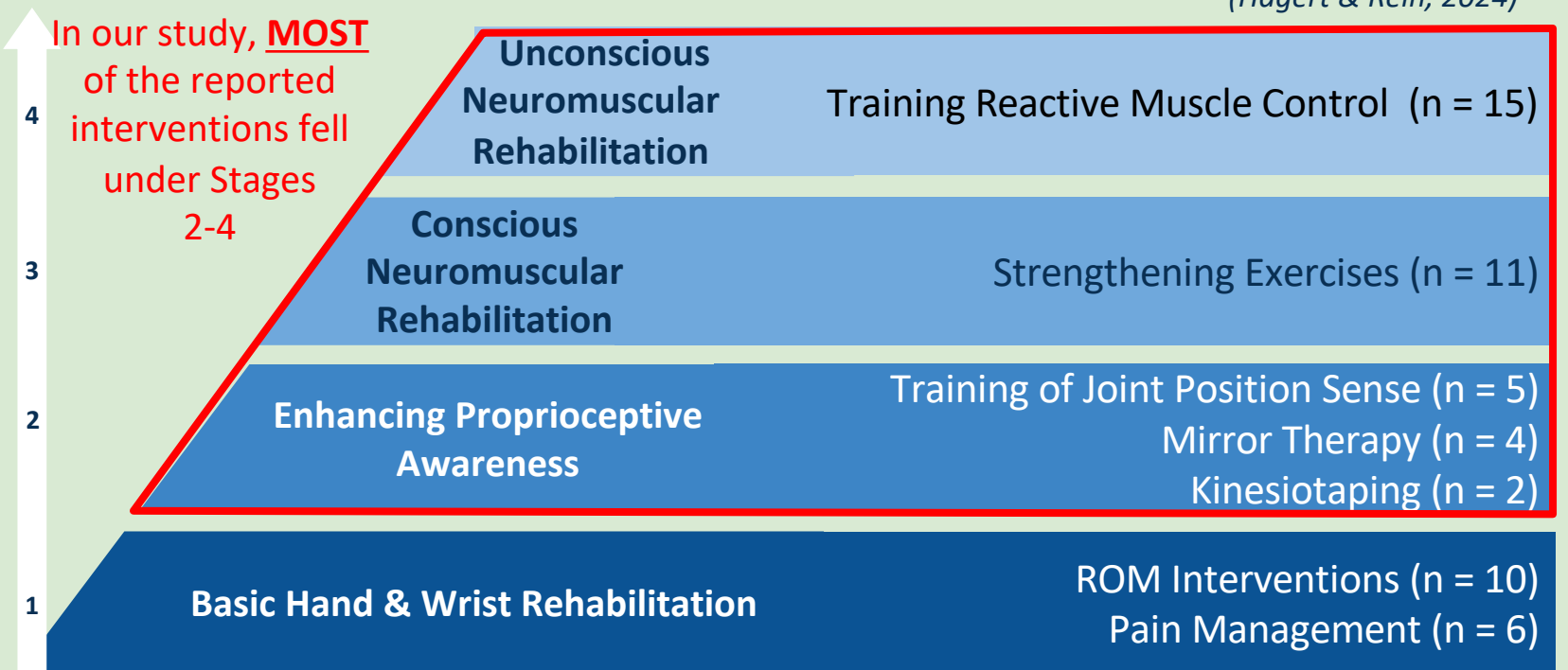
Varied Definitions & Approaches of Proprioceptive Rehabilitation

3 definitions, 7 assessments, 6 interventions



Stages of Proprioceptive Rehabilitation

(Hagert & Rein, 2024)



Similarly in existing literature,

Proprioceptive interventions primarily focus on Stages 2-4

- From Valdes & Rider, 2024
 - Reported interventions include **closed and open-kinetic chain exercises, elastic taping** to increase proprioceptive input
- From Valdes et al., 2014
 - Scoping review focusing on interventions such as **powerball, sensory discrimination training and mirror therapy**

Key Takeaways for Clinical Practice and Research

1 Theoretical frameworks (such as Hagert's 4 stages of proprioceptive rehabilitation) may help clinicians **organise and progress proprioceptive interventions** using existing equipment, promoting a more structured and intentional approach to rehabilitation.

2 Research is needed to **establish consensus** on proprioceptive rehabilitation and to **evaluate theoretical models** in relation to clinical and patient-reported outcomes, supporting standardisation of practice.

Scan here for references!

