Passive Range of Motion, Stretching and Prolonged Positioning to Prevent or Treat Contractures - Physiotherapy

Site Applicability

PHC

Practice Level

Physiotherapist

Need to Know

The purpose of this document is to provide a summary of the literature to guide PTs in decisions regarding the use of passive ROM, stretching and prolonged positioning to prevent or treat contractures.

- *Passive ROM* – Movement of a joint, using external forces only, through part or all of its physiologically available range
- *Stretch* – Short-term positioning (less than 1 minute) of a limb into a position where there is resistance, intraarticular and/or extra-articular
- *Prolonged positioning* – Maintaining a joint in a position of tissue resistance for an extended period of time i.e. greater than 20 mins E.g. splinting
- *Contracture* – tightness/limitation in length of intraarticular and/or extra-articular tissue that restricts movement

Contracture Etiology

- *Muscle*: number of sarcomeres & X-sectional area declines, loss of muscle mass & length
- *Connective tissue*: loss of elasticity; upregulation of extracellular matrix, production of cadherins (proteins involved in cell adhesion) & reduction in degradative enzymes; acute adhesions transform into chronic fibrosis
- Occurs within 2 weeks of immobilization; reversible up to 4 weeks with remobilization; irreversible after 4 weeks

Note: immobilization also reduces joint lubrication/nutrition resulting in degeneration

Guideline/

Therapeutic objectives & potential harmful effects

PROM	Stimulate joint lubrication & nutrition Maintain extra-articular tissue elasticity & length	Tissue trauma if hypermobile, excessive force or absence of normal protective mechanisms (Chau & Kong 2006) Temporary changes in BP, O_2 sat; HR & RR (Koch, 1996; Younis & Ahmed 2015)
Stretch	Maintain/temporarily increase extra-articular tissue length	Tissue trauma possible if excessive force Adverse events: in 49 trials with 2135 participants, 49 adverse events – skin breakdown, pain, numbness, venous thrombosis, wound infections, hematomas, flexion deficits and swelling (Harvey et al 2017)
Prolonged positioning	Stimulate long term change in intra/extra articular length & tension/tone	Associated with contractures of the antagonist muscles (Born et al , 2017)

Summary of evidence of effect/effectiveness

" … the evidence for the effectiveness of interventions to prevent and treat disability due to joint contractures is weak, particularly for … positioning and passive movement." Saal et al (2017)

	PROM	**Stretch**	**Prolonged Positioning**
General population	Increase in cortical excitability during and after repetitive passive movement (Onishi, 2018) Temporary benefit in joint lubrication & nutrition (Farmer & James, 2001) No literature found re	The immediate effect of a bout: - small, brief (about 5 minutes) change in ROM and passive stiffness (Whatman et al, 2006) - temporary reduction in performance (Shrier, 2005) thus best to stretch after activity - no effect on joint position sense (Bjorklund et al, 2006) Regular stretching (i.e. after repeated bouts) - Healthy older people with contracture (not frail): stat sig increase in joint mobility (Saal et al, 2017)	Increased number of sarcomeres in the lengthened muscle (Goldspink & Williams, 1990) Loss of sarcomeres in the shortened muscle (Goldspink & Williams, 1990) Atrophy/weakness of the lengthened muscle (Wilson et al 2019)

	reduction of existing contracture	- If no contracture, increases ROM (ROM = 8 deg; 95% CI 6 to 9 deg) for more than 1 day after stretching (Harvey et al, 2002) - No clinically relevant change in ROM (Katalinic et al 2010) if performed for less than 7 months [effect greater than 7 months not known] (Harvey et al, 2017) - No short-term effect on pain (high quality of evidence). Increases pain in non-neuro population by 1% (Harvey et al, 2017) - Increased isometric force production and velocity of contraction (Shrier, 2005) - No sig effect on QOL (increased by 1%) (Harvey et al, 2017) - Increases participation in life for non-neuro by 12% but 31% worse and 6% better - Increases tolerance to uncomfortable stretch sensation (Folpp et al, 2006) - Neither pre or post exercise stretching significantly decreases soreness post exercise (Andersen, 2005)	Reduction in joint lubrication, with decreased joint nutrition & subsequent thinning of joint cartilage (Farmer & James, 2001) Post joint injury and post immobilization, moderate evidence to support use of splints or casts to increase ROM (Michlovitz et al, 2004) Inconclusive effect on: - Joint mobility (Saal et al, 2017) - Spasticity (Saal et al, 2017) No evidence of effect on: - Pain (Saal et al, 2017) - QOL (Saal et al, 2017) - Participation (Saal et al, 2017)
MSK conditions	Moderate evidence of increased ROM after joint injury, fracture, and immobilization (Michlovitz et al, 2004)	Regular stretching: - TKA: 20 min, 5 sec hold, 40 to 50 reps = no sig difference in ROM, pain, pain preference or function (Kim et al, 2009) - MSK immobilization: 30 sec stretches, 30 sec rest 10 min, twice daily = decreased the loss of muscle girth, torque and ROM (Wilson et al, 2019) and increased protein synthesis if lengthened, decreased if shortened (Wilson et al, 2019)	

Neuro conditions	No evidence re the effectiveness of increasing range or reducing spasticity/ tone from central neurological lesions	No clinically significant effect on: - Joint mobility: (only 1% change) if performed for less than 7 months. (high quality evidence) Effect of longer than 7 months has not been determined. (Harvey et al, 2017) - Pain: increased by 2% (Harvey et al, 2017) Limited evidence to support the efficacy of passive stretch in improving ROM in patients in minimally conscious state (Leong, 2002) Passive ROM of fingers in 40 elderly with dementia 25 minutes, once per day, 12 weeks: improved ADL measured by Barthel (Liu et al, 2018)	Serial casting: gains obtained diminish with time (Born et al, 2017)

Recommendations: There is evidence that demonstrate benefit, for some outcomes in some patient populations, but the parameters (intensity, frequency & duration) for all potential outcomes in all populations, are not yet elucidated.

"Better understanding is required regarding the delivery of interventions, such as their intensity and duration. In addition to functional issues, activities and social participation should also be studies as outcomes" Saal et al (2017)

PROM	**Stretching**	**Prolonged Positioning**
No specific guidance re parameters for effectiveness is provided from the literature	Intensity: unclear (Saal et al, 2017). Duration: 45-60 sec per stretch reported sig improvements but those of 30 sec or less didn't (Saal et al, 2017)	No specific guidance re parameters for effectiveness is provided from the literature

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