

PUSHER SYNDROME POST-STROKE:

Background Information,
Patient Presentation, and
Evidence-Based Intervention Strategies

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Capstone Project, Spring 2017

Learning Objectives

- The learner will understand the theoretical concepts regarding the cause of Pusher Syndrome (PS).
- The learner will understand the effects of PS on the course of rehabilitation and maximal functional potential for this patient population.
- The learner will be able to describe evidence-based interventions for patients with PS.
- The learner will understand scoring for key outcome measures.
- The learner will be able to devise an appropriate plan of care for a patient that integrates effective intervention techniques with a realistic time frame for progress.

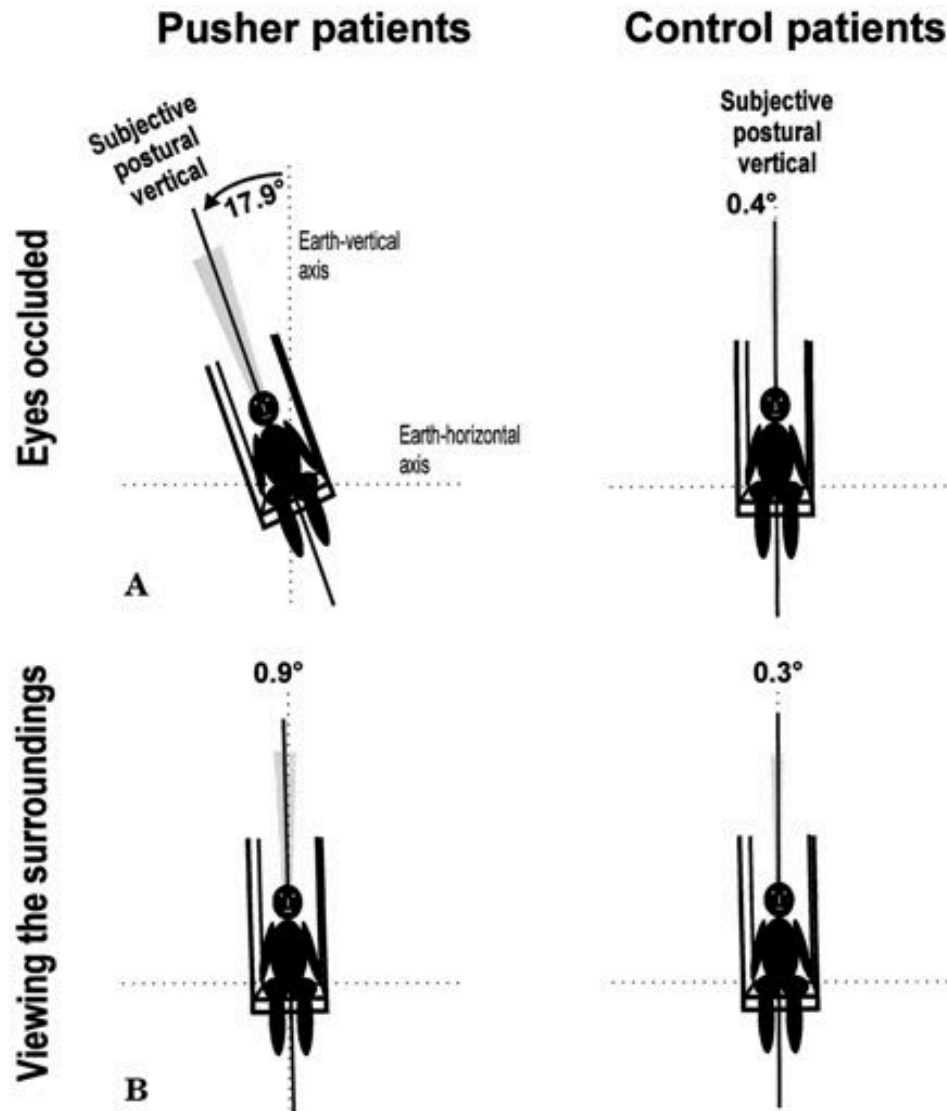
PS Epidemiology

- Occurs in 10-16% of patients following a stroke.¹
- Can occur following right-sided or left-sided stroke.
- There is a higher prevalence of PS for patients with right hemisphere vs. left hemisphere lesions.²
- Unique challenge for right-sided lesions: left neglect³

Theoretical Concepts

- **Subjective Visual Vertical (SVV):** The perception of vertical based on visual and vestibular information.^{4,5}
 - Intact in patients with PS
- **Subjective Postural Vertical (SPV):** The internal perception of postural vertical.^{4,6}
 - Impaired in patients with PS
- Incongruence between SVV and SPV.
- The result is pushing behavior, in which patients attempt to compensate for the discrepancy.⁴

Theoretical Concepts



The Bucket Test

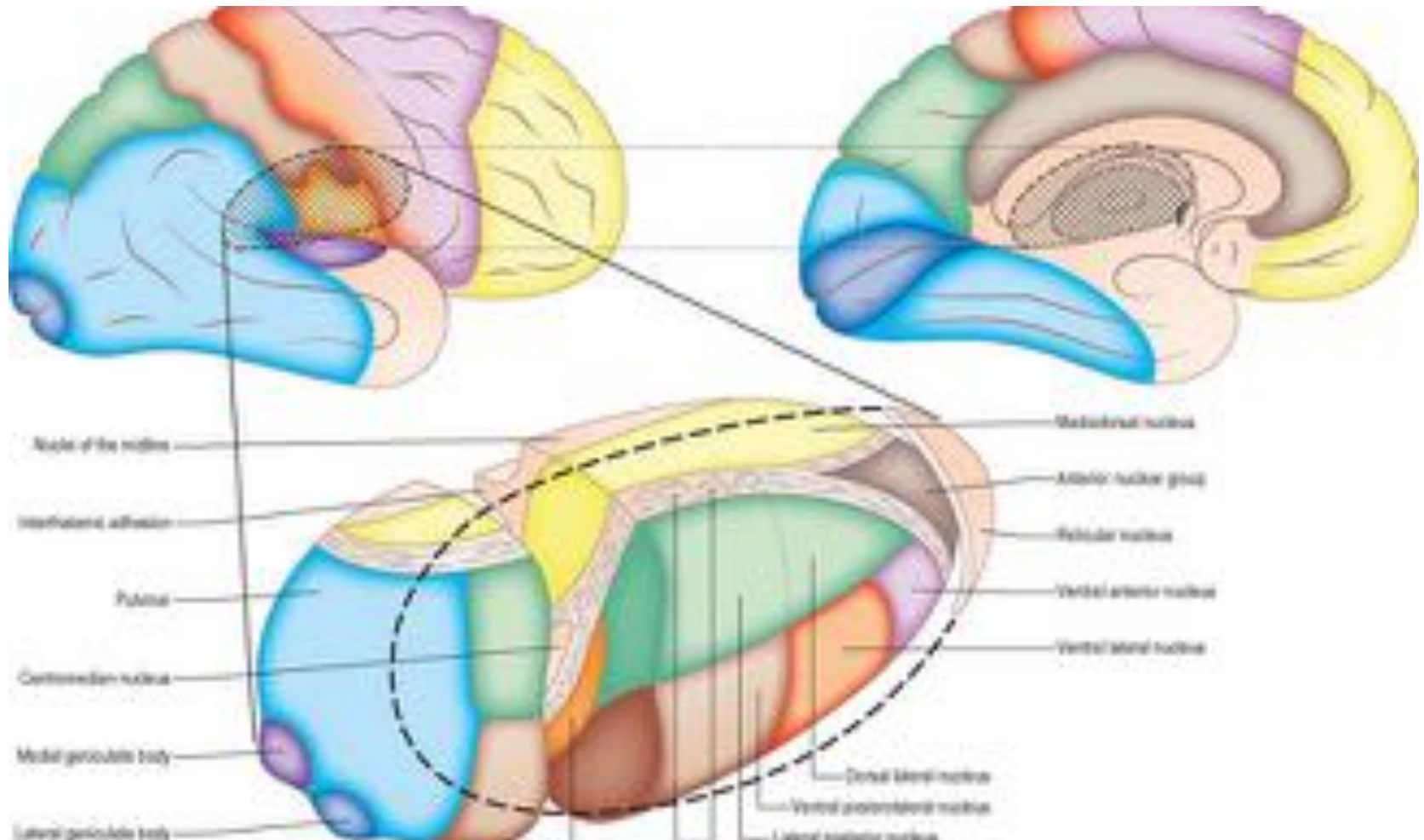


Image Reference: Janky KL, Zuniga G, Carey JP, Schubert MC. Balance dysfunction and recovery after surgery for superior canal dehiscence syndrome. *Arch Otolaryngol Head Neck Surg.* 2012;138(8):723-730. doi:10.1001/archoto.2012.1329.

Pathology: Affected Brain Regions

- 2005 study by Karnath et al.⁷
 - Larger lesion size associated with PS
 - Posterior thalamus damaged in patients with PS, spared in stroke patients without PS
 - Posterior thalamus damage associated with right- and left-sided lesions
 - Posterior thalamus damage occurs in hemorrhagic stroke > ischemic stroke
- Posterior Thalamus⁷
 - Role in graviceptive system of postural control
 - More than just a “relay center” for the vestibular system

Pathology: Affected Brain Regions



Pathology: Affected Brain Regions

- Other regions of the brain may be associated with PS.⁸
- Right-Sided Lesion⁸
 - Superior Temporal Gyrus
 - Operculum
 - Insula (posterior portion)
- Left-Sided Lesion⁸
 - Operculum
 - Anterior Insular Cortex
 - Internal Capsule extending to the lateral thalamus

Patient Presentation

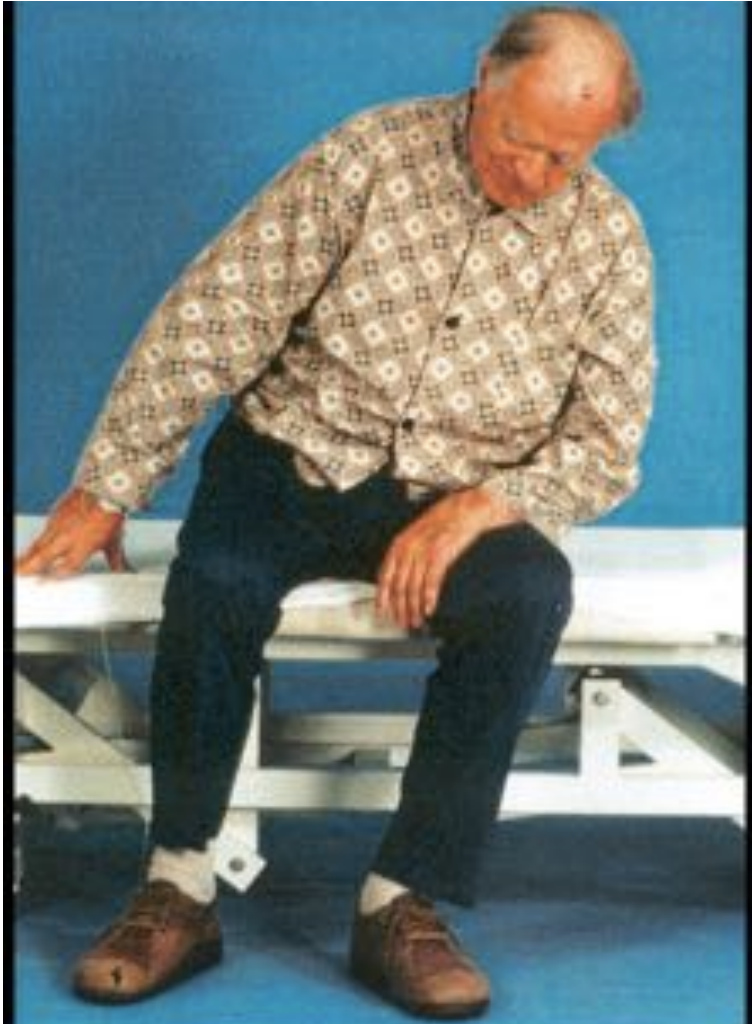


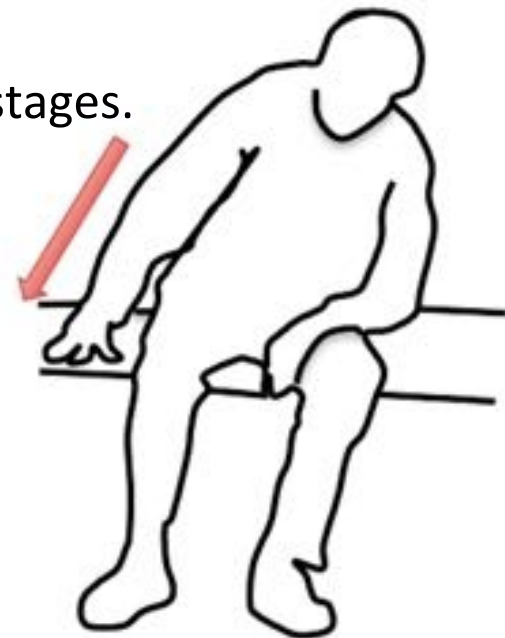
Image Reference: Karnath H-O, Broetz D. Understanding and treating "Pusher Syndrome". *Phys Ther.* 2003;83(12): 1119-1125.

Patient Presentation³

- Spontaneous posture tilted towards hemiparetic side, away from lesion side
- Extension of uninvolved extremities
- Abduction of uninvolved extremities
- Resistance to “passive correction” of posture

General Considerations

- Postural instability and increased risk of falls³
- Must overcome pushing behavior prior to progression towards other goals⁹
- Utilize pushing behavior to facilitate active participation in transfers
 - Transfer towards hemiparetic side, especially in early stages.



Primary Outcome Measures

- Scale for Contraversive Pushing (SCP)¹⁰⁻¹²
 - 3 subscales score 0-2
 - Maximum score = 6
 - A higher score indicates worse performance, more severe pushing behavior
 - Widely used in intervention-based research
- Burke Lateropulsion Scale (BLS)¹²⁻¹⁴
 - 5 Subscales
 - 2 subcategories scored 0-4
 - 3 subcategories scored 0-3
 - Maximum score = 17
 - A higher score indicates worse performance, more severe pushing
 - May be more sensitive to small improvements in pushing compared to SCP

Scale for Contraversive Pushing

A	Spontaneous body posture	Sitting	Standing
	1 = severe contraversive tilt with falling to that side	<input type="checkbox"/>	<input type="checkbox"/>
	0.75 = severe contraversive tilt without falling	<input type="checkbox"/>	<input type="checkbox"/>
	0.25 = mild contraversive tilt without falling	<input type="checkbox"/>	<input type="checkbox"/>
	0 = inconspicuous	<input type="checkbox"/>	<input type="checkbox"/>
		Total (max = 2)	
B	Use of the nonparetic extremities (abduction &)		
	1 = performed spontaneously, already when at rest	<input type="checkbox"/>	<input type="checkbox"/>
	0.5 = performed only on changing the position (e.g., on transferring from bed to wheelchair)	<input type="checkbox"/>	<input type="checkbox"/>
	0 = inconspicuous	<input type="checkbox"/>	<input type="checkbox"/>
		Total (max = 2)	
C	Resistance to passive correction of tilted posture ^a		
	1 = resistance occurs	<input type="checkbox"/>	<input type="checkbox"/>
	0 = resistance does not occur	<input type="checkbox"/>	<input type="checkbox"/>
		Total (max = 2)	

a. Touch the patient at the sternum and the back. Instruction: "I will move your body sideways. Please permit this movement."

Burke Lateropulsion Scale

Supine

Use 'log roll' technique to test patient's response. Roll first towards the affected side then towards the unaffected side. Circle the side to which the resistance is most prominent. Score below the maximum resistance felt and add one point if resistance is noted in both directions. (Patients with marked lateropulsion may resist rolling to either side, hence an extra point is added if resistance is noted with rolling both towards and away from the affected side).

- 0 = No resistance to passive rolling
- 1 = Mild resistance
- 2 = Moderate resistance
- 3 = Strong resistance
- 1 = Add one point if resistance noted in both directions

Sitting

Score with the patient seated, feet off floor, with both hands in lap. The expected hemiplegic response is for patient to carry his weight towards the unaffected side. Some patients will passively fall towards their paretic side when placed in true vertical position by the examiner. This will not be scored as 'lateropulsion'. Position the patient with their trunk 30 degrees off true vertical towards their affected side, then score the patient's response to your attempts to bring them back to vertical. The 'lateropulsion' phenomenon is an active attempt by the patient to keep their centre of gravity towards their impaired side as they are brought to true vertical.

- 0 = No resistance to passive return to true vertical sitting position
- 1 = Voluntary or reflex resistive movements in trunk, arms or legs noted only in the last five degrees approaching vertical.
- 2 = Resistive movements noted but beginning within 5 to 10 degrees of vertical
- 3 = Resistive movements noted more than 10 degrees off vertical.

Standing

Score with the patient standing with whatever support is needed. The expected hemiplegic response is for the patient to carry their weight toward the unaffected side or to passively fall towards their paretic side when placed in true vertical position by the examiner. This will not be scored as 'lateropulsion.' Position the patient with their trunk 15 to 20 degrees off true vertical towards their affected side then score the patient's response to your attempts to bring them back to vertical, then 5 to 10 degrees past vertical toward the intact side. The 'lateropulsion' phenomenon is a voluntary or reflexive response in the trunk or limbs to keep the centre of gravity towards the impaired side e.g., forced trunk curvature towards the paretic side, flexion of affected hip or knee, shifting weight to the lateral aspect of the unaffected foot.

- 0 = Patient prefers to place his centre of gravity over the unaffected leg.
- 1 = Resistance is noted when attempting to bring the patient 5 to 10 degrees past midline.
- 2 = Resistive voluntary or reflex equilibrium responses noted, but only within 5 degrees of approaching vertical.
- 3 = Resistive reflex equilibrium responses noted, beginning 5 to 10 degrees off vertical.
- 4 = Resistive voluntary or reflex equilibrium responses noted, more than 10 degrees off vertical.

Burke Lateropulsion Scale (cont.)

Transfers

Score this function by transferring the patient from the seated position first to the unaffected side, then if possible, to the affected side. The expected hemiplegic response would be for the patient to require more assistance to transfer towards the affected side (use a sit pivot, modified stand pivot, or stand pivot transfer, depending on the patient's functional level).

- 0 = No resistance to transferring to the unaffected side is noted.
- 1 = Mild resistance to transferring to the unaffected side.
- 2 = Moderate resistance to transferring is noted. Only one person is required to perform the transfer.
- 3 = Significant resistance is noted with transferring to the unaffected side. Two or more people are required to transfer the patient due to the severity of lateropulsion.

Walking

Score lateropulsion by noting active resistance by the patient to efforts by the therapist to support the patient in true vertical position. Do not score passive falling or leaning to the paretic side. Score lateropulsion as follows:

- 0 = No lateropulsion noted.
- 1 = Mild lateropulsion noted.
- 2 = Moderate lateropulsion noted with walking.
- 3 = Strong lateropulsion noted, takes two individuals to walk with the patient, or unable to walk because of severity of lateropulsion.

Circle most prominent direction of lateropulsion: left, right, posterior-left, posterior-right.

Note: Some patients may show such marked lateropulsion that they can not be assessed while standing or walking. In such cases they are scored as having a maximum deficit for those tasks not testable due to the severity of their lateropulsion.

TOTAL SCORE = SUM OF THE ABOVE _____ (Max = 17)

Secondary Outcome Measures

- Berg Balance Scale⁹
- Fugl-Meyer Assessment (FMA)¹⁵
- Functional Independence Measure (FIM)^{9,15}

Rehab Potential & Prognosis

- Long-term functional outcome potential is not affected by pushing behavior.¹⁶
- PS may result in slower progress, longer duration in inpatient facility¹⁶
- Natural resolution of pushing behavior is possible.¹⁷
- Good prognosis for overcoming pushing behavior^{3,17}
 - Likely to resolve in 6 months.



Factors Affecting Prognosis¹⁵

- Babyar et al., 2016
- Left Hemisphere
 - Older age
 - Impaired motor performance upon admission
- Right Hemisphere
 - Older age
 - Low FIM score (cognitive) upon admission
 - Increased limb placement errors upon admission

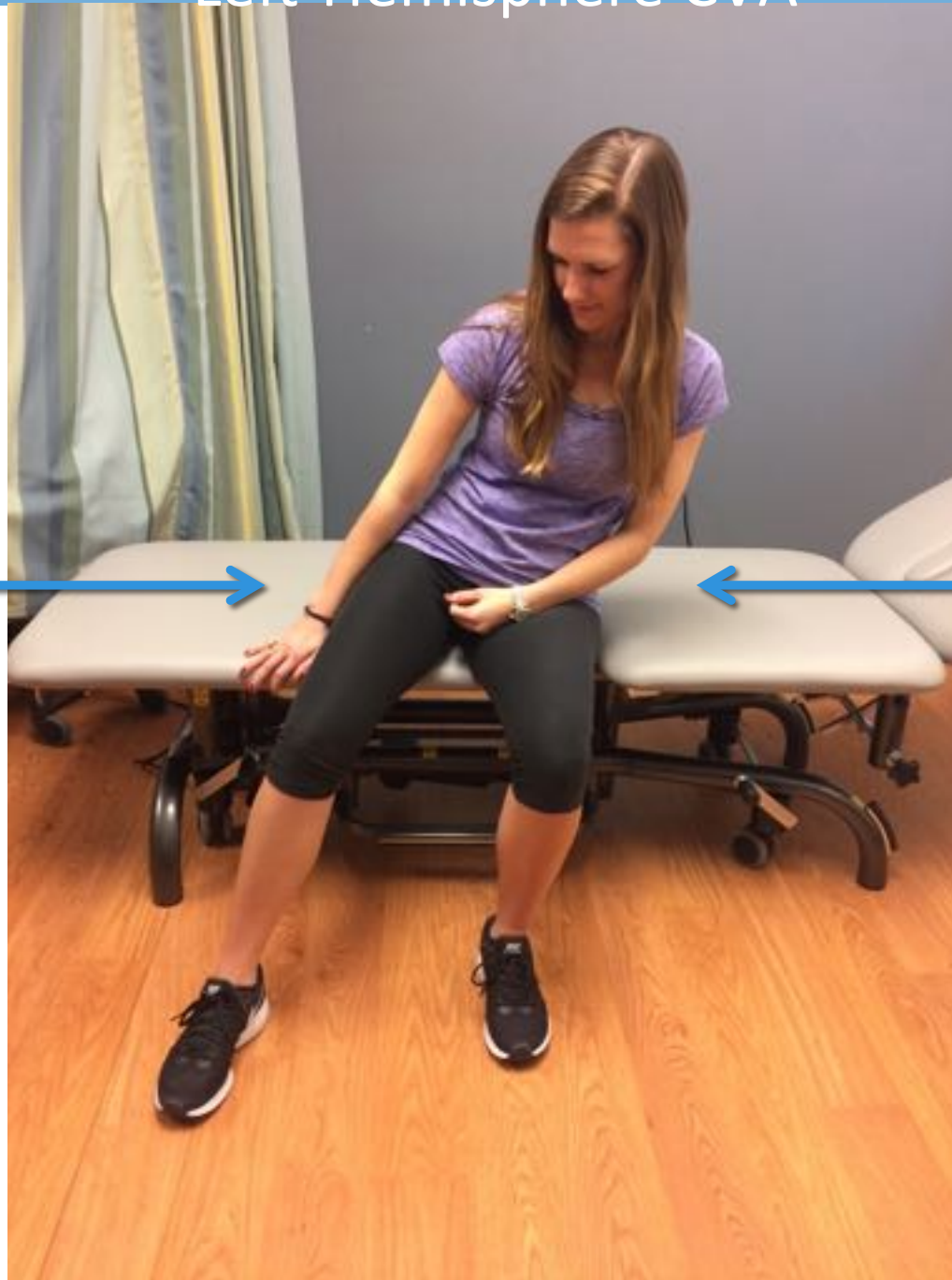
Take a Break!



Treatment Ideas: The Basics

- External visual cues^{9,18}
 - Full-length mirror with vertical tape
 - Cue of wall edge to align with vertical
 - Utilized in sitting and standing
- External somatosensory cues¹⁸
 - Patient to sit or stand with pushing side next to wall
- External targets¹⁷
 - Encourage patient to tap target with pushing extremity

Left-Hemisphere CVA



Pushing
Side

Involved
Side

Visual Cue

Spontaneous Posture



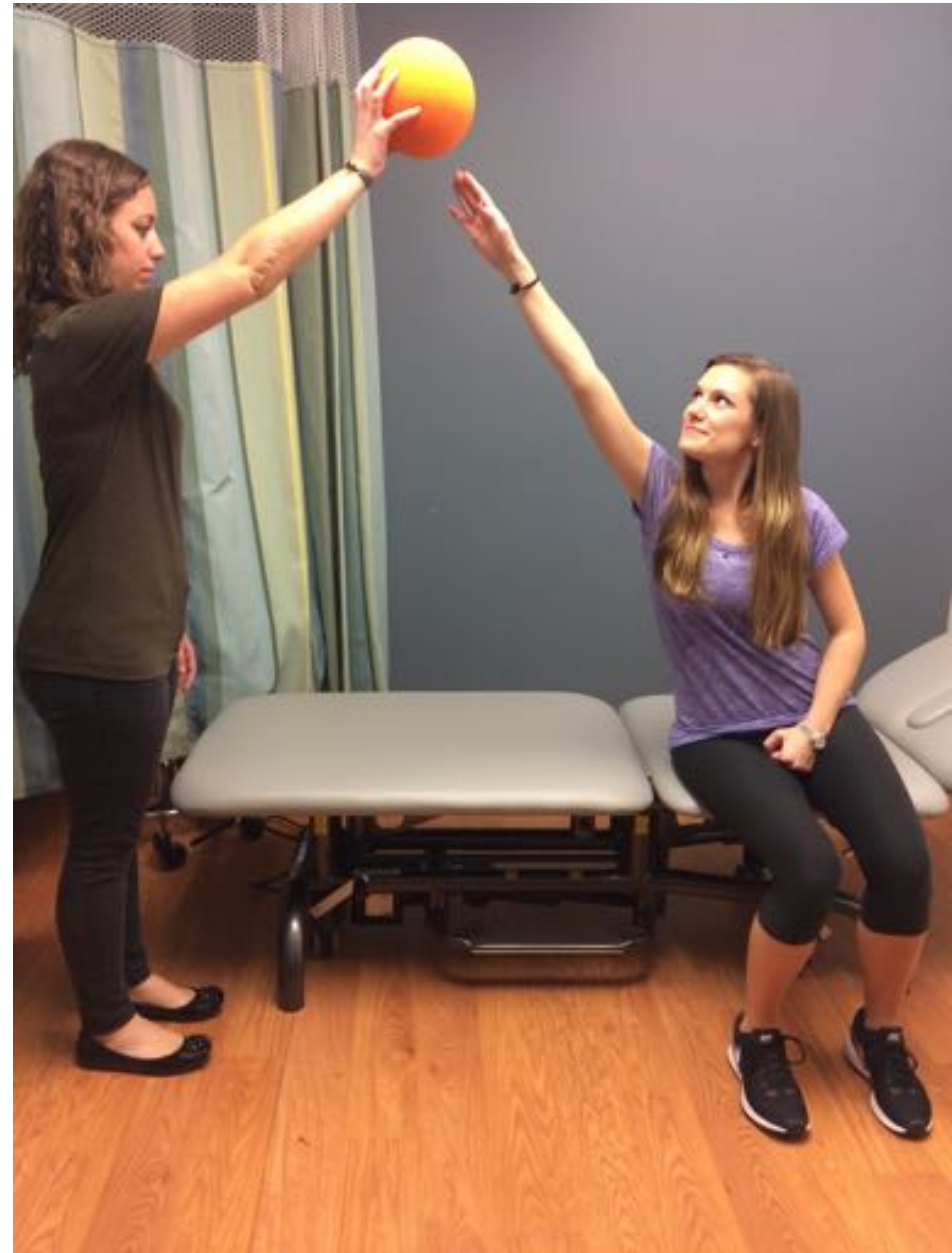
Corrected Posture



Somatosensory Cue



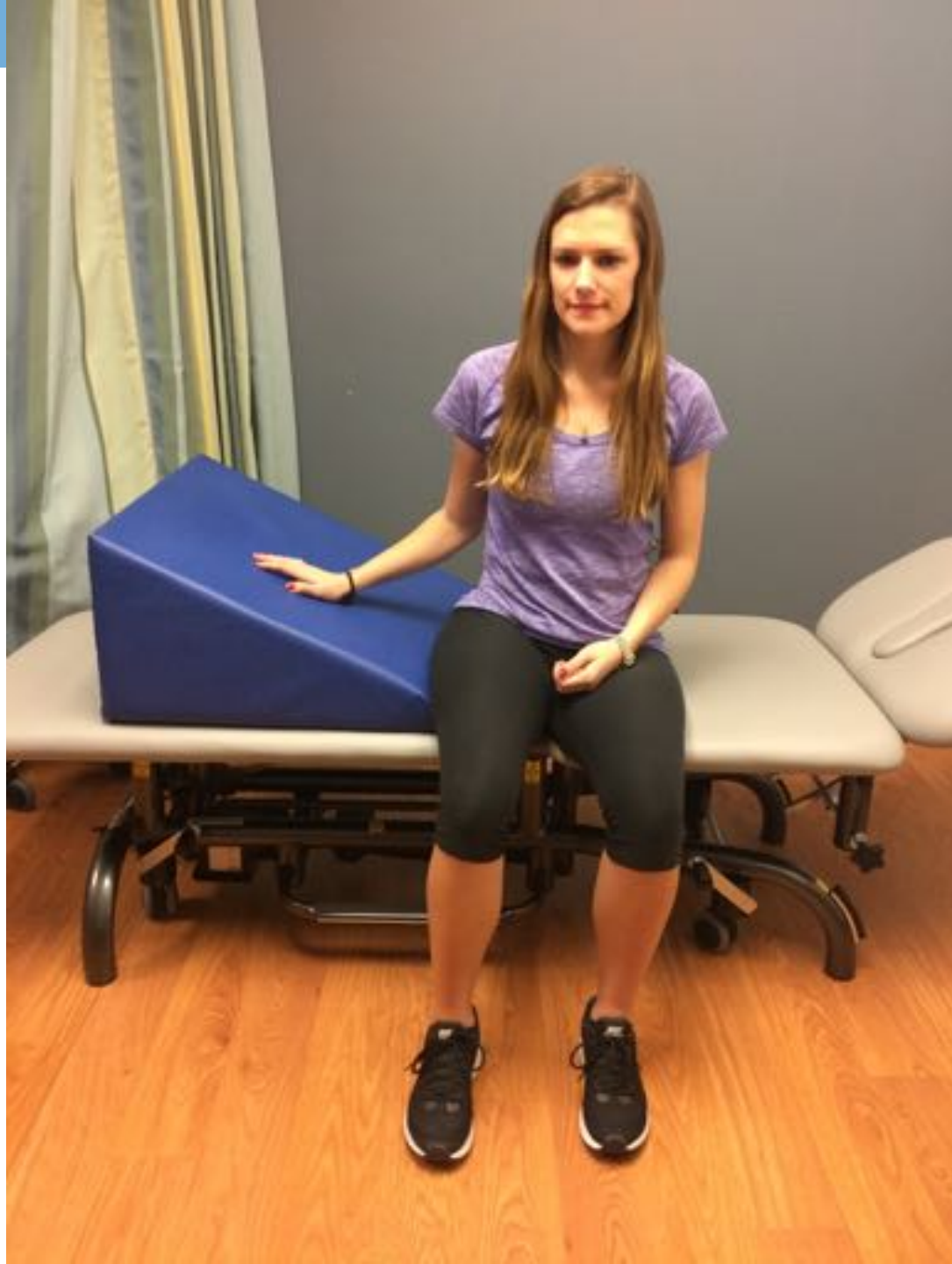
Extrinsic Goal: Target Tapping

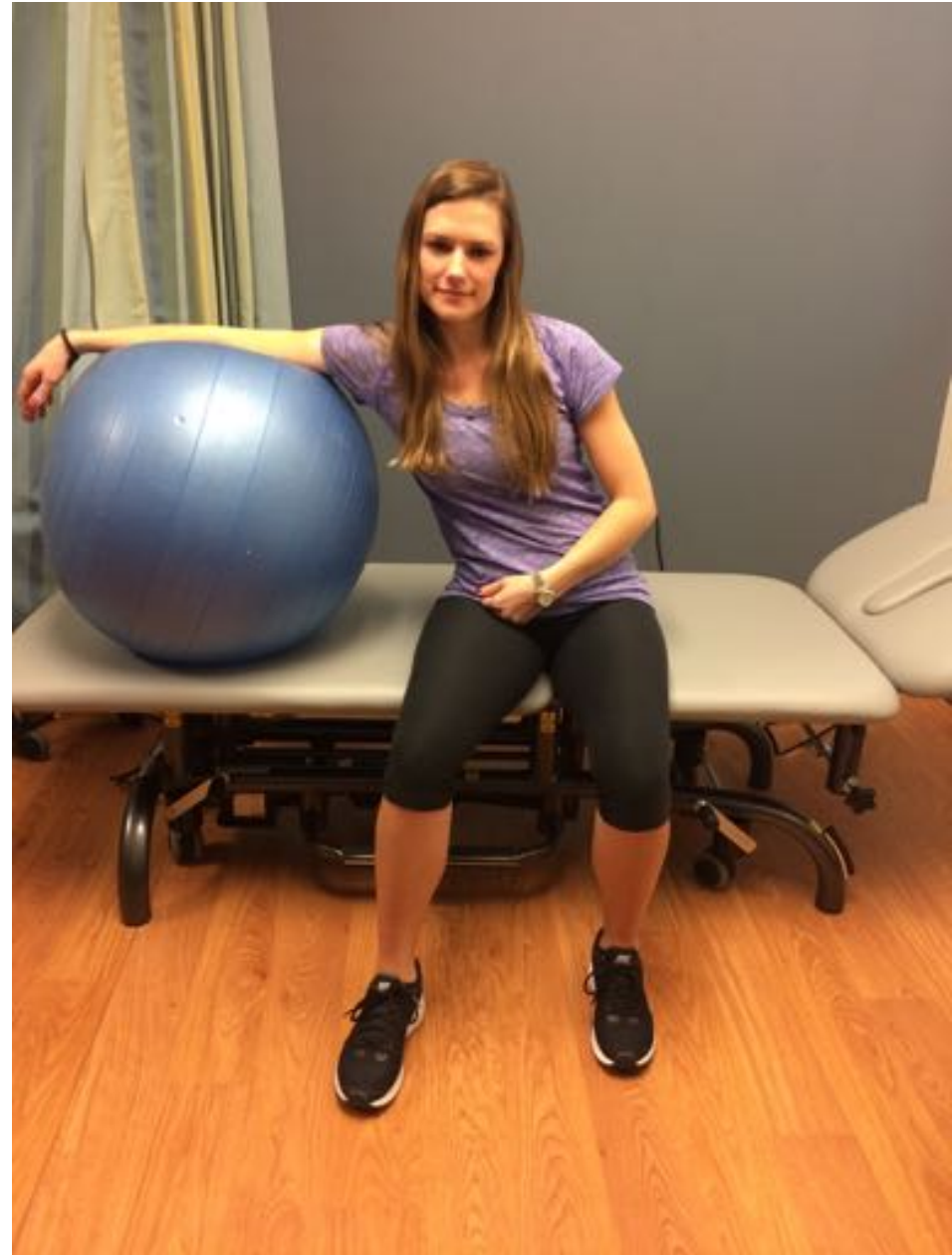


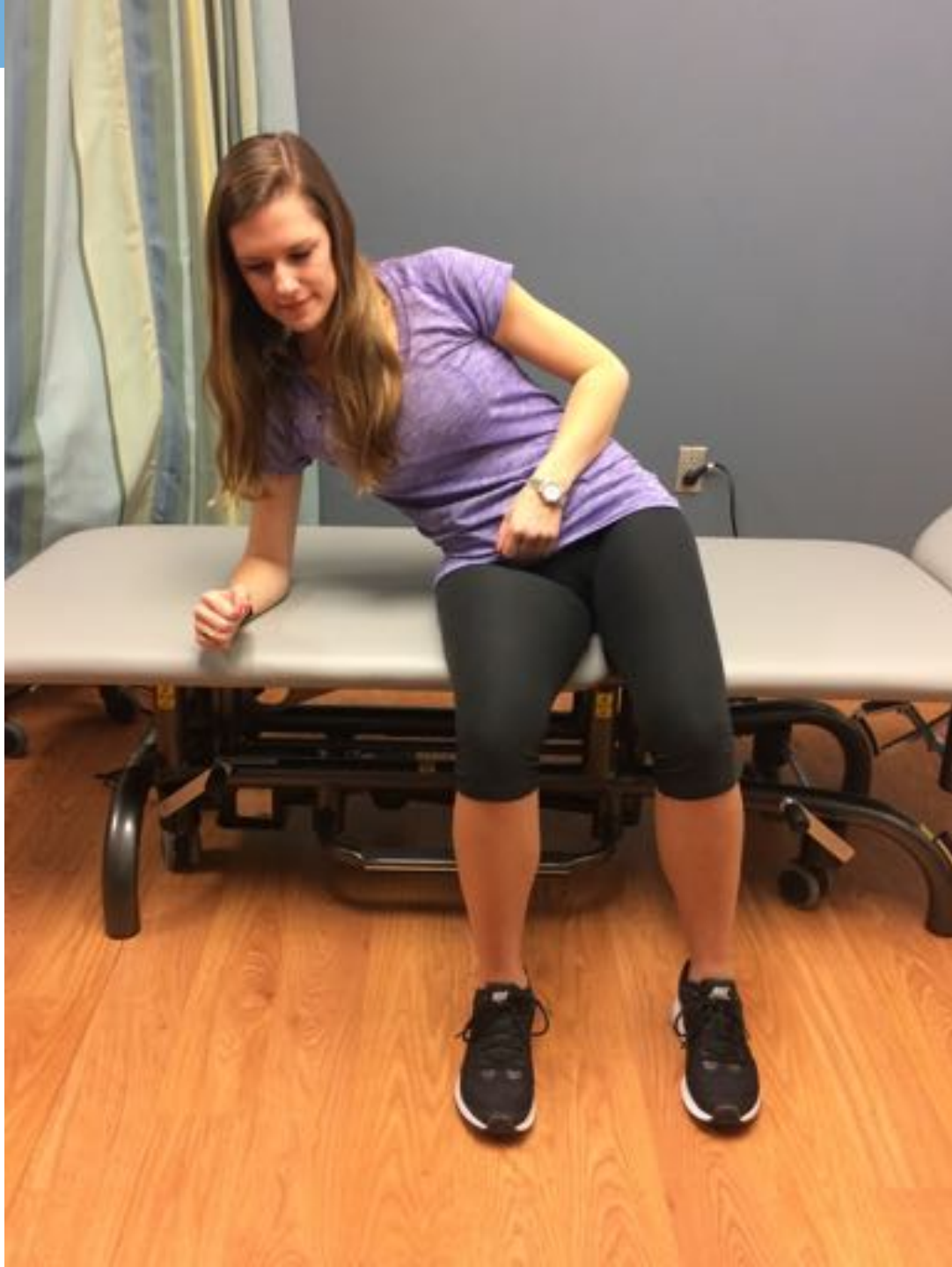
Treatment Ideas: Other Options

- Using “Props”³
 - Footstool under pushing LE
 - Wedge
 - Swiss ball
- Prolonged Weight Bearing (WB)³
 - Forearm WB through pushing arm
- Technology Resources⁹
 - Nintendo Wii









Case Example: Mr. B

- 80 yo male
- R CVA on 12/13/15
- Internal Carotid Artery (ICA) occlusion
 - Basal Ganglia
 - Internal Capsule
- Complete reperfusion – thrombolysis

Case Example: Mr. B

- Impairments Secondary to CVA:
 - Muscle spasms in L LE, sometimes in R LE with prolonged sitting
 - Left side hemiparesis
 - Pushing through right extremities
 - Left shoulder pain
- Important Medical History:
 - Coronary Artery Disease
 - Myocardial Infarction
 - Right eye blindness

Case Example: Mr. B

- Mobility at Home
 - Power w/c
 - 24 hr/day assistance
 - Sara lift at home
- Mobility in the Clinic
 - Sit-to-Stand: Min A-Mod A
 - Ambulation: +1 Mod A-Max (with platform walker)

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- See VoiceThread for video

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Aquatic Environment Benefits

- Reduced force of gravity
- Reduced impact of “graviceptive system” of postural control

Patient Case: Mr. B

- Factors for Poor Prognosis
 - Older Age
 - Severe occlusion
- Pusher Syndrome can persist following stroke, impacts independence and mobility
- What can we do for Mr. B?
 - Longer timeframe for goals
 - Goals for safety awareness with PS
 - Intermediate functional goals (i.e. scoot back in chair)
 - Tactile and verbal cues

Questions?

- If you have any questions, please contact me at Hannah_Leshin@med.unc.edu

Presentation Feedback

- Please give feedback regarding the presentation with this online survey:
 - <https://www.surveymonkey.com/r/ZW7N9K6>

Acknowledgements



References

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