Meredith Smythe

PHYT 727

**Case Study**

Ms R is a 24-year-old female, with an insidious onset of bilateral thoracic and scapular pain. She described her pain, which started in the last six months, as aching, stabbing and throbbing. Her current pain level is a 7/10. She complains of pain with prolonged sitting, lifting, and lying on her side. She previously enjoyed going to the gym to lift weights, running on an elliptical machine and taking kickboxing classes. If she tries to do these things now, it exacerbates her pain. She lives in an apartment alone and is independent with all her activities of daily living. Her past medical history includes two cardiac surgeries as an infant to repair a valve defect as well as respiratory issues that have resulted in a shift in her lung positioning. She has scoliosis with a right rotated thoracic spine with a rib hump and increased thoracic kyphosis. Her cardiovascular history and her current diagnosis are consistent with Schmorl’s nodes. She has decreased flexibility in both pectoralis major muscles as well at her latissimus dorsi. She has a severe loss of motion in thoracic extension. I would like to address the lack of thoracic extension as her main movement problem as it relates to posture and overhead reaching.

According to the Dynamic Systems Theory of motor control, movement emerges from the individual, the task and the environment. Dynamic Systems Theory states that movement comes from an interaction of systems including biomechanical factors (internal and external), environmental factors, task constraints, morphological factors and multiple body systems. I would base my examination on this theory. Based on this theory, I would want to examine multiple body systems. For example, while getting her history I would assess her cognition. This is important for treatment, because it lets the therapist know if she can follow instructions. Her cognition was not impaired and this fact will help me apply motor learning principals to design appropriate practice and feedback to her interventions.

One consideration I would have in my evaluation is assessing her environment. I would ask Ms R about her work and home. Ms R has a desk job and has pain during her workday. Possible questions include: Where does she sit at work? Does the chair have a back and what is the chair height? At home where does she sit and what brings on her pain? Ms R says she gets pain from sitting but also when she has to lift objects over her head to put them on shelves at work. Also, what are the aggravating factors when she exercises? This might reveal aspects of the task and environment that could be affecting her movement.

Another consideration in her evaluation would be to observe her posture and her movement patterns in reaching overhead. Examining the movement pattern addresses the individual aspect in Dynamic Systems Theory. It would be ideal to assess her posture in different environments to see how the environment affects her task. Upon arrival I would observe her relaxed posture in the waiting room as well as looking at her posture while she sat on different types of chairs: different heights, different materials and a large physio ball. Varying the surfaces would show how the environment affects her posture. I would ask her to get a coworker to take a picture of her posture at work and bring it to a subsequent session. I would also observe her movement patterns in isolated thoracic extension and reaching overhead. I would observe her movement with different conditions: reaching up while sitting, reaching up while standing, reaching up while sitting on a physio ball in order to see the effect the environment on her movement.

Ms R wanted to be able to get through a day of work without pain and to resume her workout routine. She lifts objects onto shelves occasionally at work and sits for long periods of time. Her long-term goal was to be able to lift 20 pounds above her head with good posture and without pain in eight weeks. Her short-term goal was to maintain good posture and lift arms overhead without pain in four weeks. Another long-term goal was for her to be able to go to the gym and lift weights and run on an elliptical without pain in ten to fourteen weeks.

Identifying control parameters in examination is another application of Dynamic Systems Theory. In the examination we found that her periscapular muscles were weak. Strength was identified as a control parameter. A control parameter will change a stable behavior by increasing variability and produce instability, which causes a change in behavior. We addressed this weakness by doing periscapular muscles strengthening exercises such as rows. As she started to get stronger and increased her range of motion there was more initially instability in her movement followed by greater stability.

Another consideration in treatment on Dynamic Systems Theory is to freeze the degrees of freedom to simplify a task and then as the patient masters this task, gradually add the degrees of freedom back into the task. She did this by sitting against a wall and reaching up. This worked her range of motion but it simplified the task by providing an external support. This exercise was part of the progression to get her to lift her arms overhead. Gradually we worked toward her reaching overhead without the wall for support.

At first, we focused on range of motion exercises to increase thoracic extension. We did seated thoracic extension and progressed the exercise where she lifted her arms with her back against the wall. At the same time we did manual therapy to gain muscle length and strengthening exercises for the periscapular muscles. When she achieved normal pain free extension of her thoracic spine unsupported, we focused on her working on overhead reaching in sitting without back support. Next, she practiced specific functional exercises that focused on overhead reaching and progressed to overhead lifting with one-pound weights. Then we progressed to her moving low weight on a shelf from a lower shelf to a higher shelf. As she progressed toward the end of her therapy, we tried to relate the specific exercises to her workout routine.

Applying motor learning principals was very important in her case and greatly enhanced her learning. The most important principal for her was to make sure she completed a large amount of practice for any one exercise. We were also mindful of her stage of learning as we designed the type of practice and our feedback. When she was in the cognitive stage of learning these exercises we provided blocked practice to facilitate her learning the task. Once, she was in the associative stage and could perform the task, we introduced random practice. Feedback is another important consideration for Ms R’s motor learning. When she was learning how to do the task we gave regular feedback. She rushed through some of the exercises and had trouble doing them correctly so we cued her to slow down and provided her an external focus of attention. One example of this was in the closed chain serratus anterior exercise. We used a mirror and drew a line on it in order for her to round her shoulders to meet that line. We also demonstrated the exercises and gave tactile cues. Once she achieved this a few times, she was in the associative stage of learning and we faded the feedback because this would be good for learning and reduce her dependency on it. Since she had problems with body awareness, feedback was focused on knowledge of results. It would have been better to start her in a quiet environment to help her focus but the clinic was busy with other patients. Using feedback effectively as a part of motor learning theory and applying motor control theories aided Ms R in reaching her therapy goals.