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Does Postural Assessment Contribute to Patient Care?

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Is the examination of posture just a tradition of physical therapy practice or is the information gathered from this assessment useful for diagnosis and treatment? The inclusion of postural assessment in the *Guide to Physical Therapist Practice*, the accreditation standards, and the patient reports of most physical therapists suggest that the profession considers postural alignment to have a role in patient care. In keeping with current professional demands, physical therapy is emphasizing evidence-based practice and outcome measures. Because criteria for reimbursement and effectiveness of treatment require outcome information and treatment time is limited, therapists are minimizing examination of impairments such as posture. Therapists attempting to meet the demands of efficient practice need to limit their examination to the impairments that are the most useful in directing treatment. Though outcome information is important, it does not direct treatment. Rather, the information obtained from assessment of impairments should guide the therapist's diagnosis and treatment plan.[12]

What is the evidence that postural impairments contribute to pain problems and need to be included in therapists' examinations? The simple answer to that question is that there is very little research to support a relationship between musculoskeletal pain and "posture."[10] Many respected texts and articles by physicians,[2,5,9] physical therapists,[1,6] and physical educators[11,14] have cited the importance of good postural alignment to health, but clinical studies have not supported these beliefs. Though I am fully aware of the lack of evidence, I cannot imagine treating any patient without assessing posture or, more precisely, alignment. When the patient with low back pain has a flat back, the emphasis of my treatment is different than when the patient has an excessive lumbar lordosis. I also expect that the contributing muscle impairments will be different in these two patients. Why is there a discrepancy between the research data and the clinical experience of so many generations of physical therapists? I believe some of the explanations are (1) a narrow definition of what constitutes posture; (2) attempts to find a linear correlation between pain and spinal curvature without identifying subgroups of extremes of increased or decreased curvature; (3) failure to consider alignment as only one of multiple factors causing pain; (4) attempts to relate postural faults and muscle weakness; and (5) limited research examining the relationship between alignment impairments and alterations in movement.

Studies of posture have focused on a narrow definition. Posture or carriage of the body should be considered differently than the alignment of one segment in relation to an immediately adjacent segment. The connotation of posture is the overall relative disposition of the segments of the body from head to foot, including the general curvature of the spine. Probably more important than overall posture in the sagittal plane is the relative alignment of one or two segments in multiple planes. For example, the degree of lumbar curvature can vary a great deal, but one vertebra cannot change its sagittal position with another vertebra by more than a couple of millimeters before contributing to pain from spondylolisthesis. Paraspinal asymmetries indicative of only a few degrees of rotation between 2 vertebrae can be more problematic than several degrees of an increased curve involving 5 vertebrae. The

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study by Norton et al,[8] published in this issue of *JOSPT*, demonstrates that the calculation of lumbar curvature varies with the instrumentation and the formula used for calculation. Sensitive measurement tools, capable of detecting significant variations in alignment of a segment or two from the normal range, are going to be necessary to assess the relationship of alignment to pain. Imaging systems, such as the one used in the study by Lentell et al,[7] also published in this issue of *JOSPT*, are currently necessary for this task; but the possibility exists that noninvasive, less expensive measurement systems could detect risk factors before they result in pain. Studies have not addressed whether some postures are more likely to result in intersegmental changes such as spondylolisthesis than other postures. Until a few years ago, medical practitioners would have been unable to correlate obesity in children and the presence of diabetes. But now the relationship between bodyweight and type II diabetes is clear, so weight can be considered a risk factor. Furthermore, we also know that fat distribution over the abdomen is a greater risk factor for diabetes than fat distribution over the hips and thighs. But, even with diabetes, a linear correlation between bodyweight and the severity of the disease has not been demonstrated. Similarly, we cannot expect a linear correlation between spinal curvature and severity of back pain because too many other factors affect the condition. We need to avoid generalizing the negative results of studies of overall posture or even of spinal curves and propose other more incisive questions before assuming that alignment is not important.

Defining subgroups of extreme postures is a necessary step in the consideration of alignment as a contributor to mechanical pain problems. Establishing normative values with standard deviations for spinal curvature would be useful in analyzing the effects of extreme variations of spinal alignment on the development of pain problems. To use alignment as a guide to or an indicator of mechanical pain would require that the degree of deviation is sufficient to be defined as a risk factor. Scoliosis is a good example of a condition in which the degree of malalignment is important. A few degrees of scoliosis does not require intervention, but once the curve reaches a critical angle, surgical intervention is recommended. Physiological measures used by physicians have wide standard deviations that can be considered within the normal range. Blood pressure can vary from 70/40 to 130/90 and still be considered within the normal range. Similarly, measures of heart rate and cholesterol levels have wide ranges before they are considered abnormal. Extremes in alignment, such as the flat back versus the severely lordotic back, could both be greater risk factors for pain than the presence of a lumbar curve in the normal range. Classifications of patients such as those who have pain with lumbar flexion versus those whose pain occurs with lumbar extension may be guided in part by spinal alignment. We also know that patients with spinal stenosis have pain with the small increase in the lumbar curve that occurs in standing and usually cannot be classified as having a lumbar lordosis. Thus, back alignment cannot be expected to correlate with all causes of pain even when pain is elicited in a common movement direction.

Alignment is only one of multiple factors contributing to the development of mechanical pain. Other demographic information can also influence whether the measure of lumbar curvature is important. Age, sex, weight, and activity are variables that influence the interpretation of physiological measures and certainly, they can also influence the interpretation of alignment and kinesiological measurements. For example, an individual with an increased lumbar curve who sits most of the day may not have back pain. But if another individual with the same excessive lumbar lordosis has a job that requires standing all day, he or she is probably more likely to develop back pain. The individual who is overweight with a ponderous abdomen who stands all day may be at greater risk of developing back pain than an individual who is slender with the same alignment who also stands for prolonged periods. I believe most clinicians who use postural alignment as a guide to their diagnosis and treatment have consciously or subconsciously defined for themselves the degree of deviation, the context, and the modifiers that when combined reach a level of perceived clinical significance.

Studies suggesting that posture was not correlated to muscle strength also raised doubts about the value of alignment impairments because of the lack of valid information about muscle function.[4,13] However, studies of muscle mutability suggest that adaptations of muscle other than ''weakness'' could underlie variations in posture. The classic study of Williams and

Goldspink[15] demonstrated that sarcomeres are added and lost in series, which affects muscle length. This finding raises the possibility that a postural fault such as an excessive anterior pelvic tilt can be the result of increased muscle length and not decreased muscle strength. Other studies have demonstrated that the passive tension of muscle has a high correlation with muscle volume.[3] Thus anterior pelvic tilt could also be the result of hypertrophy of the back extensor and hip flexor muscles, which in combination create a greater passive tension for anterior pelvic tilt than the passive tension created by the abdominals for posterior pelvic tilt. A variety of combinations of muscle length and passive tension can be proposed to explain postural alignments. To develop an effective treatment program, the therapist should determine the combination of these impairments that is producing the alignment fault and the association with the pain problem. Therefore, negating the value of postural assessment because muscle weakness is not always a factor is overlooking other possible biological explanations involving muscle mutability that may have even greater implications for treatment.

The Williams and Goldspink[15] study also demonstrated that the addition of sarcomeres in series shifts the active length-tension curve of muscle to the right. The consequence is that elongated muscle would not move a segment through the same range of movement as a shorter muscle would. Thus a patient with a markedly downwardly rotated and adducted scapula, indicative of a long serratus anterior muscle, would not achieve 40° of upward rotation and adequate abduction of the scapula when performing 180° of shoulder flexion. A reasonable assumption is that biomechanical systems are similar to mechanical systems; thus, optimal alignment is the desirable if not the necessary requirement for optimal movement. The static position is indicative of the effect on the moving parts as well as on the precision of motion. The misalignments of the foot are good examples. Arch supports are often recommended for the pronated foot because the abnormal distribution of forces during walking can result in foot pain. Similarly at the shoulder, when the humerus is aligned in medial rotation and the lateral rotators do not correct the starting position during shoulder flexion, the greater tuberosity of the humerus can impinge on the acromion.

Physicians use outcome assessments of changes in pain and performance, but their surgical and pharmaceutical treatments are directed toward correcting the pathophysiological problems causing the pain. The findings from physiological measurements direct treatment. So too must physical therapists use biomechanical measures of impairments to direct treatment. Alignment as a critical component of movement must be one of the impairments that are assessed. In my judgment, the current preponderance of negative studies about the relationship between posture and pain are more reflective of the types of questions that have been asked and the analysis that has been used than of the lack of a relationship. Assessment of alignment impairments has to be an important step in designing an appropriate treatment program for correcting mechanical impairments. We need to pursue the studies that will enable us to define the relationships among specific alignment impairments, altered movement patterns, contributing muscle adaptations, patient modifiers, and mechanical pain problems.

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