

RESOURCE PAPER FOR TEACHERS

**INTEGRATING THE SHOULDER COMPLEX TO THE
BODY AS A WHOLE: PRACTICAL APPLICATIONS
FOR THE DANCER**

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1. INTRODUCTION



Figure 1: Ease and elegance in the shoulder complex

The focus in many forms of dance training is often on the movements of the lower body- the legs and feet. Movement of the upper body- trunk, shoulders, and arms, is often introduced later. Because so much emphasis is placed on function of the trunk and legs, and since most injuries for dancers occur in the lower body regions, it is easy to overlook the importance of optimal function of the shoulder and arms.

The shoulder complex (defined as the humerus, clavicle, sternum, and scapula bones that form a girdle or shawl over the rib cage) in combination with its connection to the trunk and, ultimately, the lower body, has many components. There are three important concepts (listed below) that, when understood and experienced, can help dance educators and dancers better make the important connections to merge maximal range of motion with well aligned and supported movements that create full body artistic expressiveness.

KEY CONCEPTS

- MOBILITY/STABILITY

The shoulder complex has multiple joint connections (articulations) that provide much more available range of motion in the upper body, than in the joints of the lower body. It favors mobility, while the lower body favors stability.

- FORCE COUPLES

Because of the available mobility in the shoulder complex there must be dynamic muscle force connections that provide needed stability and balance motion across the joints. Understanding and experiencing these force couples (muscle force connections) helps the dancer perform movements that are full motion, but well supported.

• UPPER/LOWER BODY CONNECTION

The movements of the shoulder complex must connect dynamically to the trunk and to the lower body with a sense of integration of these movements to create optimal whole-body performance. Without this integration, the dancer can appear disconnected between the upper body and lower body when moving. There is the sense that the upper body is somehow an afterthought in the movement process. Through guided exploration that includes learning basic anatomy, the dancer can experience the various complex movements of the shoulder complex and learn how they integrate with the trunk and lower extremities to enhance efficient movement. The purpose of this paper is to provide the dancer or the dance educator with practical information about the shoulder complex, including some anatomy and movements mechanics, with a focus on experiential activities that can be easily integrated into dance instruction.

2. ANATOMY AND MOVEMENTS OF THE SHOULDER COMPLEX

BONES AND JOINTS

In order to fully appreciate the movements of the shoulder complex, it is important to identify the bones that comprise it and understand how they should normally align (see Figure 2). The bones of the shoulder complex include the:

- 2 scapulae in back
- 2 clavicles in front
- 1 sternum in front
- 2 humerus bones of the upper arm (not labelled)

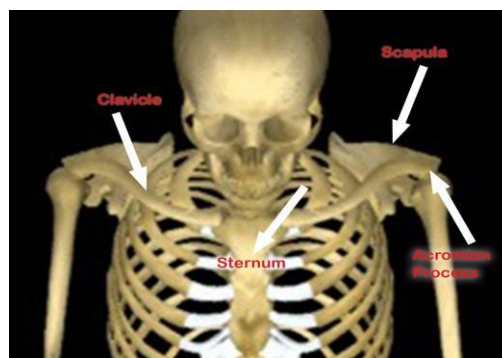


Figure 2: Skeleton with identifying landmarks

The joint articulations formed by these bones create a “shawl” effect, as you can see in Figure 3, that sits on top of the ribcage with the scapula hanging off the back.



Figure 3: Shawl effect

The joints formed by the bony articulations include the acromio-clavicular joint, the sterno-clavicular joint, and the gleno-humeral joint. The acromio-clavicular joint (Figure 4) is located on the top of the complex where the clavicle articulates with the acromion process of the scapula. The sterno-clavicular joint (Figure 5) is located in the front of the complex on the upper chest where the innermost part (the medial aspect) of the clavicle articulates with the sternum of the chest wall. The gleno-humeral joint (Figure 6) is the most lateral joint articulation where the ball of the humerus bone articulates with the very shallow glenoid fossa of the scapula to form the actual “shoulder joint”.



Figure 4: The acromio-clavicular joint

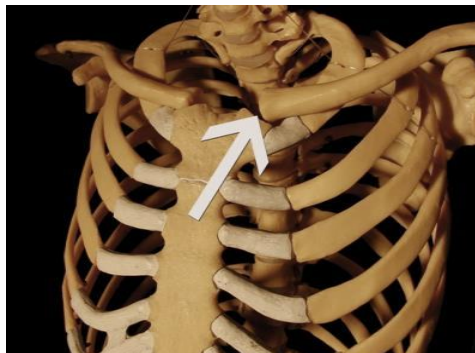


Figure 5: The sterno-clavicular joint



Figure 6: The gleno-humeral joint

It is a goal for dancers to be able to identify the bones and joints of the shoulder complex and have an awareness of where they are located on the body. This is accomplished by the use of a skeleton model. Students can complete a learning activity ([see Learning Activity #1](#)) using the skeleton in which they work in pairs to identify these bones and joint structures on the skeleton, and then find them on each other as surface landmarks. These activities facilitate tactile awareness and a connection to where these structures are on the dancer's body.

LEARNING ACTIVITY #1 – APPRECIATING THE BONY STRUCTURES

Students work in pairs to identify the bones and surface landmarks of the shoulder complex:

- Locate bones and bony landmarks on the skeleton
- Locate joints in the shoulder girdle complex on the skeleton
- Identify by touch the locations of these structures on each other for surface anatomy awareness
- Identify where the structures are found - front, side, and back of the body

JOINT MOVEMENTS

Once the bony structures of the shoulder complex are understood, it is important to gain an understanding of the movements that are possible within the complex. Each joint described above contributes important movement to the overall range of motion of the shoulder complex, but it is helpful to break down these movements into understandable sections. Let us start with the scapula.

SCAPULA

The scapula moves on the back of the rib cage as follows:

- Elevation: the scapula slides upward on the rib cage towards the ears (Figure 7, left)
- Depression: the scapula slides downward on the ribcage away from the ears (Figure 7, right)
- Retraction: the scapula moves toward the spine (Figure 8, left); pulling the scapulae together toward the spine
- Protraction: the scapula moves away from the spine and around the side of the ribcage (Figure 8, right); the mid-back opens and scapula spreads
- Upward rotation – the lower tip of the scapula swings out and up like a pendulum (Figure 9)
- Downward Rotation – the lower tip of the scapula swings down and back to its neutral position



Figure 7. Scapular elevation (left) and Scapular depression (right)



Figure 8. Scapular retraction (left) and Scapular protraction (right)



Figure 9. Scapular rotation.

The hands simulate the lower tip (inferior angle) of the scapulae swinging outward and up. For scapular downward rotation, the scapula swings back into place.

HUMERUS

The shoulder joint is also known as the gleno-humeral joint. This is a ball and socket joint, which moves in three planes (sagittal, frontal, and transverse). The ball is the head of the humerus, and the socket is shallow, so there is potential for a great deal of mobility. Because the gleno-humeral joint is very mobile, it is inherently unstable; most of its stability comes from soft tissue structures like ligaments, capsule, and muscles. The motions of the gleno-humeral joint are as follows:

- Flexion – movement of the humerus in the sagittal plane (arms go up in front of body).
- Extension - movement of the humerus in the sagittal plane (bringing arms downward and back away from body).
- Abduction – movement of the humerus in the frontal plane away from the trunk (moving sideways and away from midline).
- Adduction – movement of the humerus in the frontal plane toward the trunk (toward midline).



Figure 10: Movement of the gleno-humeral joint

- Internal (inward) Rotation – movement of the humerus on an axis within the joint so the upper arm rotates towards the torso.
- External (outward) Rotation – movement of the humerus on an axis within the joint so the upper arm rotates outward.

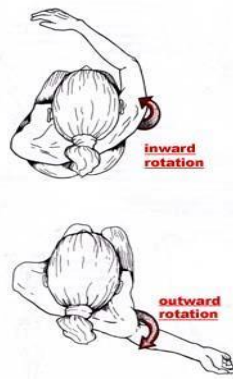


Figure 11: Inward and outward rotation

Figure 10: Illustration: Calais-Germain, B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.103. Used with permission.
 Figure 11: Illustration: Calais-Germain, B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.104. Used with permission.

LEARNING ACTIVITY #2 – PRACTICE JOINT MOTION AND APPLY TO DANCE MOVEMENT

Students practice in partners identifying the motions of the scapula, humerus, and clavicle by actively performing the motions and reciting them aloud for audio repetition of learning as shown in Figures 7-12. Students or the teacher can call out a sequence of actions to test recall and ability to enact the action. Students can devise a port de bras, then name the anatomical action of each movement.

CLAVICLE

The clavicle (or collarbone) is a long, thin bone that connects the scapula to the sternum with a joint articulation at each end (Figure 12). It serves to anchor the shoulder joint and scapula to the front of the body by its attachment to the sternum. While the clavicle does not have a great deal of motion, it moves upward and rotates when the humerus is moving into flexion in order for the shoulder complex to perform full range of motion overhead. Rotation of the clavicle occurs on its long axis like a stripe spinning around on a candy cane. The clavicle has joint articulations at both ends. It does not move as much as the humerus or the scapula but performs an important role in the overall function of the shoulder complex. The clavicle provides mobility and stability on the ribcage by anchoring the shoulder joint and scapula to the trunk.

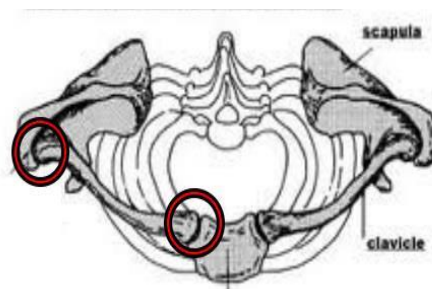


Figure 12: Clavicular articulations

Figure 12: Illustration: Calais-Germain, B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.105. Used with permission.

The combination of movements of the scapula, the humerus, and the clavicle, work together to provide full overhead motion for the dancer. Each of these bones must perform their own unique “choreography” to allow the full motion to happen. When the humerus moves into flexion or abduction overhead, the scapula must be able to move efficiently into elevation and upward rotation, while the clavicle must upwardly rotate and elevate. If the clavicle is restricted then overhead motion of the shoulder complex will be restricted. This restriction could occur from a trauma to either joint articulation, such as a fall onto the outstretched arm. You can experience how restricting clavicle motion restricts overhead motion of the arm by trying a quick activity with a partner. One person stands in front, places hands over the clavicle, and prevents it from moving. The partner then attempts to raise the arms overhead. The motion restriction will be obvious (Figure 13).



Figure 13: Restricting movement of the clavicle

SCAPULAR HUMERAL RHYTHM

Once the dancer understands the basic anatomy of the bones and joints of the shoulder complex it is important to put all of this together to gain an appreciation of how these joints work synergistically to create motion. As mentioned in the previous section on the clavicle, the humerus, scapula, and clavicle each need to perform a very specific “choreography” or “dance” and do these motions together as a team to create the full mobility in the upper extremity. This “dance” is called scapular humeral rhythm and refers primarily to the relationship between the amount of movement of the humerus compared to the scapular movement on the ribcage when you raise your arm overhead or to the side.

The movement of the clavicle in this “dance” is small, but important as already discussed. The gleno-humeral joint moves twice as much as the movement of the scapula on the ribs in a 2:1 ratio (Figure 14). Each bone must perform its motions at just the right time in the action in order for the choreography to be correct, much like a dancer waiting in the wings for the correct timing with which to make an entrance. If the dancer enters with the wrong timing, the choreography will not go as desired. Figure 14 shows scapular humeral rhythm from the view of looking down from above, and illustrates a person opening the arms wide to the side then closing in front. The gray zone represents the motion that is possible by ONLY using the shoulder joint. The pink zone adds in more range of movement for the arms as it includes the added use of the scapula.

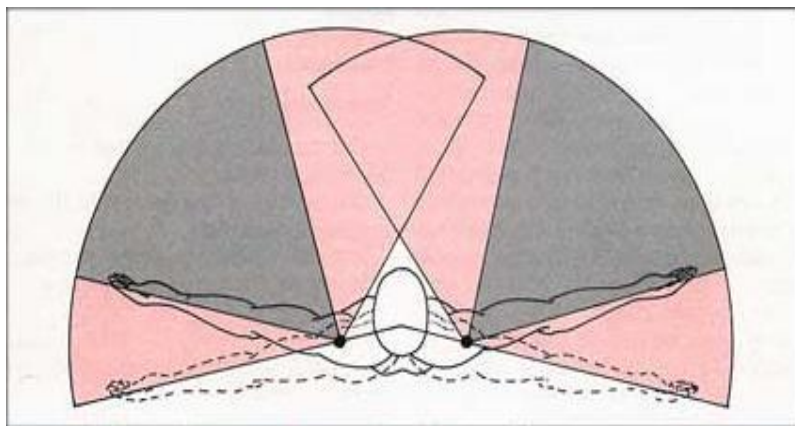


Figure 14: Scapular-humeral rhythm.

Figure 14: Illustration: Weineck, J. *Functional Anatomy in Sports*, Fig. 3-31. Elsevier (Year Book Medical Publishers), 1986, p.73. Used with permission.

LEARNING ACTIVITY #3 – SCAPULAR HUMERAL RHYTHM

Dancers work with a partner to explore scapular humeral rhythm in 2 parts.

- The partner serving as the dancer begins with arms by the side of the body and slowly moves the arms sideward through 2nd position into overhead 5th position.
- Part 1. The partner standing behind the dancer feels with her hands how much the scapula moves into upward rotation (with slight elevation) as the arms move to second position. (Figure 15).
- Part 2 – Then the partner can place her right hand on the upper portion of the humerus and feel the amount of motion that happens as the dancer performs the same movement through 2nd position into 5th position.
- Compare these two movements and note that the humerus moves a great deal more than the scapula to perform the same motion. (2:1 ratio described above)



Figure 15: Feeling scapular humeral movement

Figure 15 shows the dancer moving arms from 2nd position toward high 5th position. As the arms pass through 2nd position, the partner can begin to feel how the scapula moves on the back of the rib cage (review scapular movements to be clear on scapular elevation and upward rotation).

Now that you have explored the anatomy and movements of the shoulder complex, we will switch our focus to the muscles that create these movements and their important connections. These muscle connections allow the mobility of the shoulder complex to be maximized, while providing needed stability for movement.

3. FORCE COUPLES: MUSCLE CONNECTIONS OF THE SCAPULA AND UPPER EXTREMITY

A force couple is defined as two forces that are equal in magnitude and opposite in direction. It is important to remember that muscles only exert a pulling force, and this allows the force coupling to work. A force couple allows for a pulling in one direction by a muscle and a counter pull in the opposite direction by another muscle. These opposite pulling actions, together, provide support and stability for scapular motion. This relationship is especially important around the scapula due to its inherent instability on the back of the rib cage. To help the dancer visualize this, they could be encouraged to imagine that each border of the scapula has a string or tether (these are the muscle attachments). The scapula moves, with movement of the humerus, by gliding across the back of the rib cage. The scapula must stay close to the rib cage but serves as a dynamic connector of the arms to the back allowing for full mobility of the arm. Figures 16 and 17 show artistic representation of these muscle tethers around the scapula.

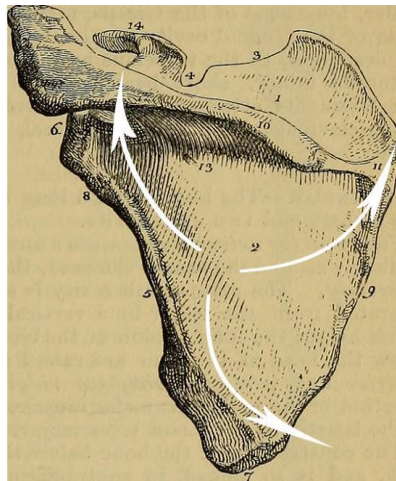


Figure 16: Muscle "tethers" around the scapula



Figure 17: Direction of pull created by muscles
Figure 16 and 17: Illustrations: Google Images

Let's explore two specific examples of force couples around the scapula. Force couple A (see Figure 22) exists between the upper and lower trapezius muscles.

FORCE COUPLE A (UPPER AND LOWER TRAPEZIUS)

The upper trapezius attaches from the base of the skull and the spine bones (vertebrae) of the neck down to the top of the scapula. This muscle produces elevation and upward rotation of the scapula. The lower trapezius attaches from bones of the spine in the mid back to the scapula (see Figure 18). This muscle produces depression and upward rotation of the scapula. When these two parts of the trapezius muscle are equal in strength and function, they cancel out the elevation and depression (up and down movement of the scapula). Again, imagine the tether from top and bottom pulling equally to stabilize the scapula thereby allowing the scapula to freely upwardly rotate without losing its placement on the ribcage. The trapezius is seen as one continuous muscle but actually one can see that the upper section has fibers that can pull upward on the scapula, while the lower section has the capacity to pull downward. If one of these parts of the muscle is dysfunctional, such as tightness in the upper trapezius and weakness in the lower trapezius (a common pattern in dancers), the balance is lost and the scapula tends to ride up into elevation, thus losing its stable position on the back of the rib cage.

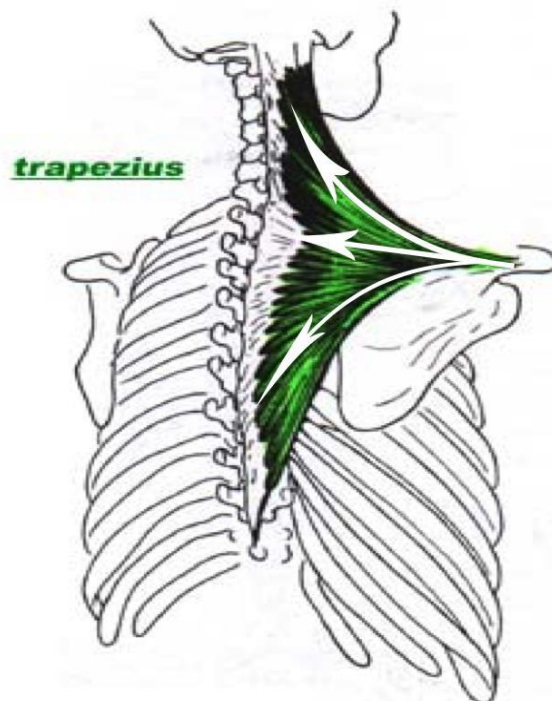


Figure 18: *Trapezius muscle*

Figure 18: Illustration: Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.74. Used with permission.

FORCE COUPLE B (SERRATUS ANTERIOR AND MIDDLE TRAPEZIUS/RHOMBOIDS)

The second force couple occurs between the serratus anterior and middle trapezius & rhomboids (see Figures 19 and 20). The serratus anterior attaches from front edges of the ribs like fingers and these fingers reach back under the scapula to attach to the inside border of the scapula near the spine. The serratus anterior pulls the scapula into protraction. The middle trapezius is a superficial muscle and the rhomboids lie underneath. These muscles pull the scapula into retraction (toward the spine). If, however, there is dysfunction such as a weak middle trapezius or a weak serratus anterior, the scapula will not remain stable on the ribs when you begin to exert force with the arm, as seen in Figure 19. An action like doing a push up or pushing against a door requires the scapula to support the arm for stability. If this does not occur, the arm tries to perform the motion thereby losing the anchoring effect of the scapula and connection of the upper extremity to the trunk.

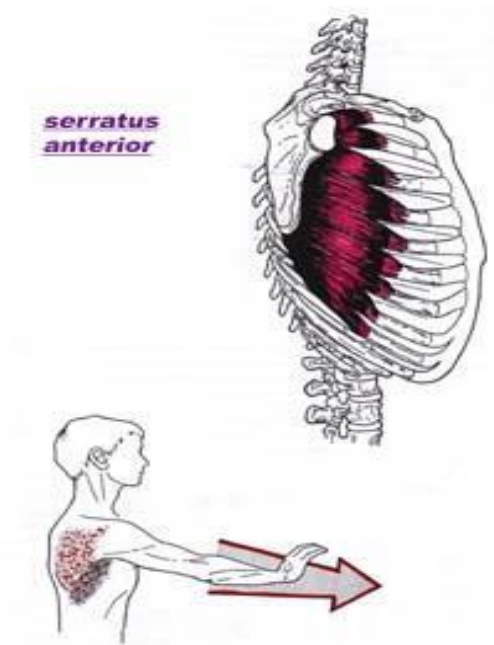


Figure 19: Serratus Anterior

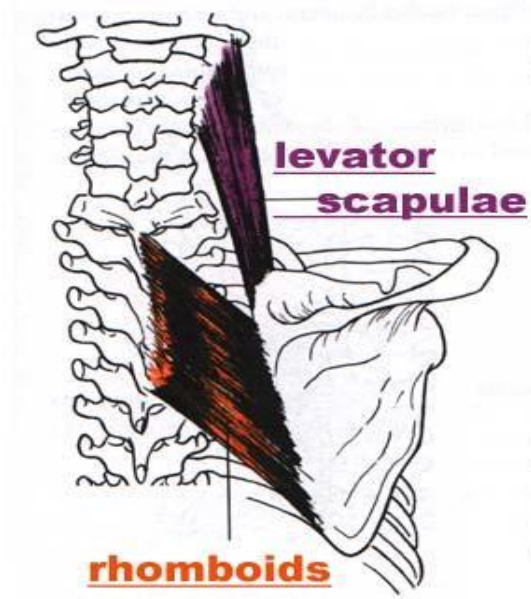


Figure 20: Rhomboids and Levator Scapulae

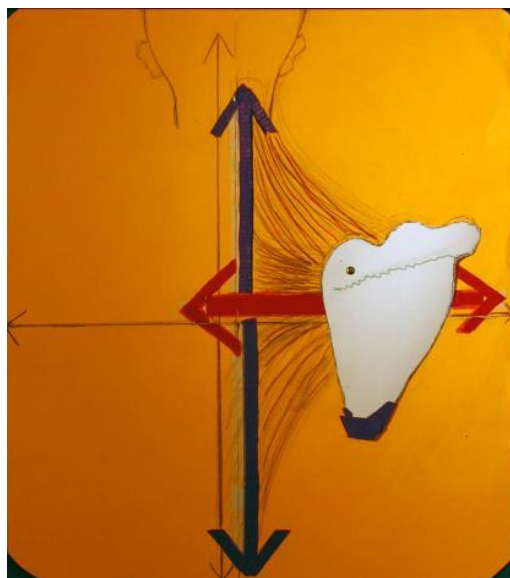


Figure 21: Diagram of "Wheel" showing scapular support and mobility (Image: Judith Steel)

Purple Arrow: Force couple A (upper and lower trapezius)

Red Arrow: Force couple B (middle trapezius, rhomboids and serratus anterior)

Figure 19: Illustration: Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.114. Used with permission.

Figure 20: Illustration: Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.117. Used with permission.

Figure 21 shows the wheel showing scapular support and mobility. The concept of force couples, though somewhat complex, can be better understood with experiential activities in a dance class (**see Learning Activity #4**). The combination of these two force couples forms a wheel-like relationship around the scapula and serves to "tether" it for stability while allowing mobility.

LEARNING ACTIVITY #4 – EXPLORING FORCE COUPLES

Force couple A: Upper/lower trapezius:

- One person pushes down on shoulders of partner.
- Feel the connection of keeping the scapula down with the push of the arms.
- This activates the lower fibers of the trapezius muscles.



Figure 22: Force couple A

Force couple B: Serratus anterior and middle trapezius and rhomboids:

- One partner standing, one partner lying, place hands together to feel the isometric resistance.



Figure 23: Force couple B

LEARNING ACTIVITY #4 – EXPLORING FORCE COUPLES CONTINUED

Force couple B contd:

- Partners stand face each other – one lifts the arms to 2nd position, the other partner provides resistance by placing her arms inside the other, thus providing a counter force (pushing out).
- The partner in 2nd position meets this resistance by activating the serratus anterior and trapezius while maintaining good alignment and width across the back.



Figure 24: Force couple B (cont.)

4. THE SHOULDER JOINT AND ROTATOR CUFF MUSCLES

The muscles and force couple movements of the scapula are the most complex in the upper body, but there are also other important muscular considerations at the gleno-humeral joint (shoulder joint) that should be understood to fully appreciate the comprehensive function of the entire complex.

The gleno-humeral joint is a ball and socket joint with a large range of motion, but limited stability due to the minimal bony articulation between the humeral head (“the ball”) and the glenoid fossa (“the socket”) of the scapula. As a result, the shoulder joint must rely on a series of ligament and capsular structures as well as the rotator cuff muscle group for stability. The rotator cuff muscle group consists of four small muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) that attach from various locations on the back, top, and underside of the scapula to the head of the humerus (the ball portion) and part of the joint capsule that surrounds this joint (see Figure 25). These four small muscles act like fingers gripping a ball and serve to pull the humeral head into the joint socket to give it more stability.

The rotator cuff muscles work in a force couple with the larger deltoid muscle to maintain a good position of the humeral head with the joint surface of the scapula (glenoid fossa). Imagine this joint is like trying to balance a golf ball on the top of a golf tee.

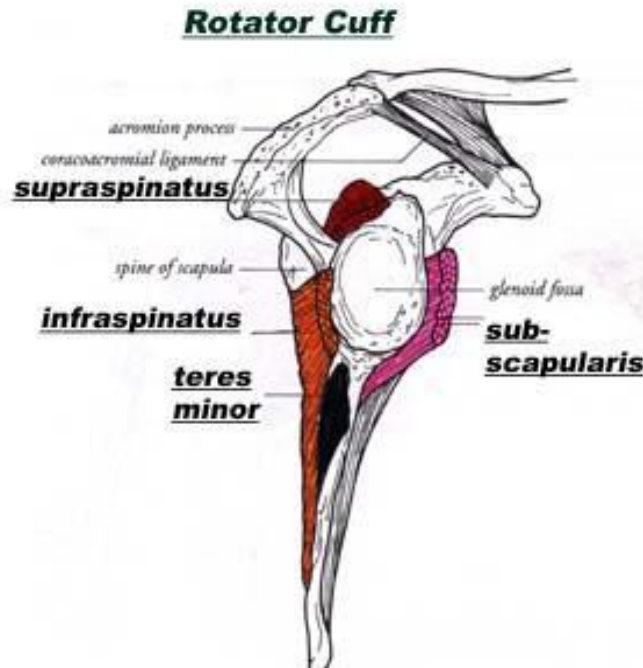


Figure 25: Rotator Cuff

Figure 25: Illustration: Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p.122. Used with permission.

Figure 25 provides a side view looking at right shoulder joint. These small muscles act like a group of fingers to literally hold the head of the humerus against the joint surface of the scapula in the glenoid-humeral joint. Imagine they “grasp” the ball of the humerus to hold it snugly in the joint.

If there is dysfunction or weakness in the joint or the rotator cuff muscles, the head of the humerus will drift upward and impinge (smash into and get pinned under) the underside of the scapula (acromion process). Also, if the dancer has poor posture (e.g. forward head, forward rounded shoulders, and slumping in the mid-trunk), the shoulder joint is placed in a very poor position to line up the head of the humerus with the glenoid fossa. This results in inefficient muscle firing, poor stability, and the possibility of onset of pain when lifting the arms overhead (**See Learning Activity# 5**).

LEARNING ACTIVITY #5 – EXPERIENCING ROTATION OF THE HUMERUS

One partner sits while other stands.

- Partner seated, internally and externally rotates the humerus while maintaining good width in shoulders. This motion is performed by the muscles of the rotator cuff. Explore this rotation while keeping the tip of the shoulder stable.
- Standing partner can touch the top of the humerus to cue partner to move only the humerus without allowing tip of shoulder to roll in or out (Figure 26). Standing partner, (Figure 27), touches distal end (toward the elbow) of humerus on both arms while seated partner explores internal and external rotation.



Figure 26: Finger cueing to top of humerus



Figure 27: Finger cueing to lower humerus

5. INTEGRATION OF THE SHOULDER GIRDLE TO THE TRUNK, PELVIS AND LOWER EXTREMITIES

The ultimate goal for the dancer is to incorporate an understanding of the function and role of the shoulder complex into a whole-body experience that integrates the shoulder complex motion effectively and efficiently with the trunk, pelvis, and lower extremities. In order to accomplish this goal the dancer should have opportunities to integrate knowledge of anatomy and function, with actual movement experiences in class. The dance educator can remind students of the anatomy and function and provide exercises that allow the student to experience motion that incorporates the upper extremities, the trunk, and the lower extremities. During these movement experiences in technique class it is helpful to ask questions of the students such as:

1. Do you sense the width of the arms in 2nd position equally across the front and back of the upper body?
2. When embodying the idea of arms as part of a larger shoulder complex; can you connect the idea of arms as a 'shawl' draping over the shoulders while performing port de bras?
3. Can you feel the energy of the arms integrating with the trunk and legs as you move through space?

Working in pairs can also be an effective way to experience and better understand these movements and how the shoulder complex moves and connects to the trunk and legs. A partner can provide important verbal and tactile feedback as the dancer practices various movements. The activities in this paper provide opportunities for these experiential pairings for learning.

LEARNING ACTIVITY #6 – INTEGRATION OF THE SHOULDER COMPLEX TO THE TRUNK AND LOWER EXTREMITIES

- In partners working in grand plié in 2nd, (Figure 28), on the descent, imagine the back widening and the arms supported from the back. The partner standing behind brushes the back of the scapula down and out to facilitate the connection of the arms to the back.
- Imagine also that the front of the body is widening sideward to find width. The partner behind can also brush across the tops of the shoulders all the way out to the side of the shoulder to facilitate this 'widening' image.
- The dancer performs a dégagé to the front (Figure 29) while the partner places hands on the back of the rib cage. The dancer meets the resistance backward while not allowing the resistance to throw her weight forward. This helps to facilitate the connection of the arms to the trunk and into the legs.
- Finally, on your own, try shifting weight through a chassé or temps lié. Add port de bras, changing the arms, and connecting the idea of the scapula supporting arms from the back. As weight shifts from one leg to the next, maintain the balance of the spine, ribs, movement of the scapula without distorting the upper body. Partners can observe each other experimenting with larger dance movement and provide feedback for each other.



Figure 28: Grand plié in 2nd



Figure 29: Dégagé to the front

6. COMMON DANCER ISSUES IN THE UPPER EXTREMITY

It is helpful for the dancer, and dance educator, to understand common dysfunctions that occur in the joints and muscles that comprise the shoulder complex, as well as related dysfunction in the trunk that impacts upper body function. These dysfunctions can result in poor quality movements when dancing and can escalate to painful conditions if left uncorrected. The dancer performs various port de bras movements frequently and when the scapula and gleno-humeral joint do not operate efficiently together, as described earlier, these movements will be of poor quality, and may have limited mobility and/or pain. Here are three commonly occurring upper body and trunk physical issues common to dancers, along with some cueing ideas for dance educators to help minimize these issues:

POOR POSTURAL SUPPORT FOR THE SHOULDER JOINT AND SCAPULA

The shoulder complex (humerus, scapula, and clavicle) should sit on top of the trunk with good alignment of the gleno-humeral joint, good stability and positioning of the scapula in back, and an openness of the chest. If there is muscle weakness in the scapular retractors, and weak core support from below, the dancer will end in a slumped posture with the head in a forward position, the shoulder joint rolled forward and in, and a collapsing in the front of the chest. The other commonly occurring component to this postural problem is tightness in the *pectoralis minor muscle* (see Figure 31). This muscle lies on the anterior surface of the ribs under the larger pectoralis major muscle. When tight, it becomes like a 'backpack strap' that is pulled too tight in the front. This shortening causes the scapula to tip and wing in the back and can contribute to tightening in the front of the chest.

CUEING IDEAS TO ADDRESS THIS ISSUE

Smooth out the clavicle from sternum to tip of shoulders. Think of the tip of the shoulders (acromion process) as arrows moving laterally and sideways to encourage the notion of arms as part of the 'side body' not 'front body'.



Figure 30: Encouraging lateral movement

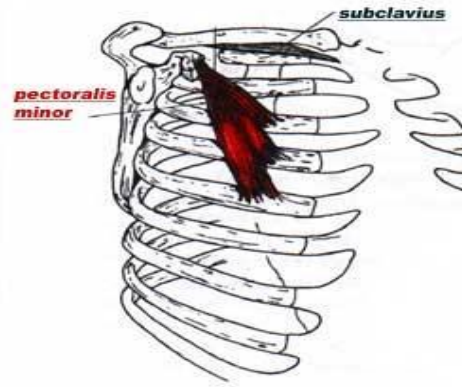


Figure 31: Pectoralis minor muscle

Figure 31: Illustration: Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 1993, p. 166. Used with permission.

POOR MECHANICS OF THE SCAPULA WITH OVERHEAD MOVEMENTS: (SEE FIGURES 32 & 33)

With overhead motion of the arms, as into port de bras, the scapula should move into upward rotation, with slight elevation allowing the arms to move overhead with good support from the scapula. However, dancers often present with weakness in the scapular muscles, as well as tightness in the upper back, resulting in over elevation of the scapula when performing overhead movements. When this occurs there is pinching and compression in the muscles of the upper back and neck. There is also a loss of the sense of breadth across the upper back. When this faulty movement pattern occurs over and over again it usually results in upper back and neck tightness and pain. In some instances dancers may pull down too much on the scapula and lengthen the upper trapezius and lock the scapula on the back when trying to move overhead. This situation results in an imbalance as well and can also cause pain and dysfunction in the neck and upper back.

CUEING IDEAS TO ADDRESS THIS ISSUE

Shake out the arm and let the weight fall downward along the side of the body. Think of allowing the arm to lengthen before moving up into flexion or abduction. Once the dancer begins to move the arms provide the cue to allow the shoulder blade to move up and away. This allows the scapula to serve as a counterweight to the arm rising and reduce the likelihood that the dancer will either lift the scapula too much in elevation or lock the scapula on the back of the ribs when attempting to move the arms overhead. In Figure 32, the dancer has arms raised overhead in shoulder flexion with scapula upwardly rotated but the scapula is elevated too much resulting in the top of the shoulder appearing elevated.

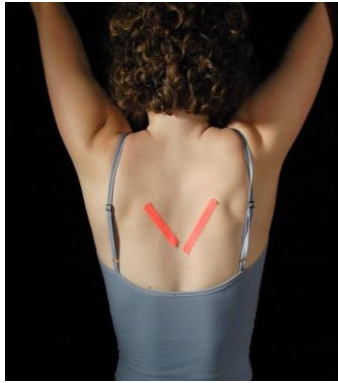


Figure 32. Too much elevation

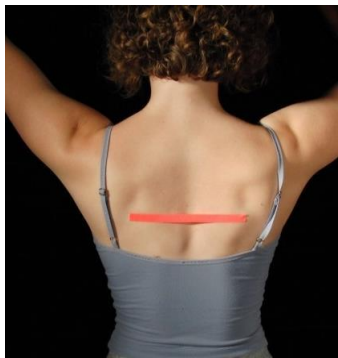


Figure 33: Wider back position

HYPEREXTENSION OF THE TRUNK (SEE FIGURE 34)

In this posture the dancer is pushing the ribs forward or “hyperextending” the middle portion of the spine in relation to the position of the head and low back. With this posture the dancer loses the connection of the head and neck to the pelvis because the ribs are not balanced over the pelvis. This posture undermines the connection of the arms to the torso and the torso to the pelvis. It also produces increased tension in the upper chest area and posterior neck regions that will cause fatigue and pain.

CUEING IDEAS TO ADDRESS THIS ISSUE

Cue the dancer to stack the head on the rib cage and the rib cage on the pelvis with a connection from the base of the ribs to the pelvis. The image of having bungee cords attached from ribs to pelvis provides a connection while also allowing movement. This cue activates the abdominals for support anteriorly during movement. There should also be cueing to narrow the front of the ribs and to release or open the mid-back to allow the scapula to find a neutral position (figure 35).



Figure 34: Hyperextension seen from the front



Figure 35: Opening mid-back

Dance educators and dancers should work actively to reduce these common dancer issues through explorations in technique classes that include cueing and tactile activities and stretching and strengthening activities as part of a comprehensive conditioning program. Bringing attention and awareness to some of these patterns and misalignments can reduce overuse pain and improve aesthetics for the dancer.

7. SUMMARY

Although it takes some time to understand the shoulder complex, it is very important for the dancer to fully explore its anatomy and movements in order to grasp how these joints and muscles provide a great deal of motion in the upper body, as well as providing stability (anchoring) for these motions. Once the dancer understands the relationship between utilizing the mobility of the shoulder complex, with the needed stability of muscle control and correct postural support it can change how one moves through space and helps to reduce pain associated with poor function. Working in technique class to understand how the force couples provide muscular support for the scapula is paramount. Once the dancer can sense the position of the scapula, and assess how well the arms are supported with muscle control of the scapula, it will be possible to demonstrate clear and integrated upper body motion with support. Finally, the dancer can gain an appreciation for how the upper body is part of the whole; understanding that motion in the upper body does not begin and end with the arms.

Utilizing experiential activities and cueing can aid the dancer to find the connection of the shoulder complex to the trunk, and down to the pelvis and legs. The understanding of how the upper body interfaces with the trunk and lower extremities helps to integrate all parts of the body effectively resulting in a pleasing aesthetic and a lower risk for injuries.

As you reflect on the various key concepts of this paper consider the following questions:

1. How does the scapula and arm move together in port de bras?
2. How do force couples support the idea that the arms connect to the back?
3. How does the upper body connect to the lower body through the trunk? What does this feel like when it happens?
4. How can you access full rotation in the shoulder (gleno-humeral) joint and still maintain good trunk alignment?
5. Of the common issues described in this paper, is there one that you can readily relate to your own performance? What can you do to address this issue?

8. ILLUSTRATION CREDITS

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9. RECOMMENDED READING

1. Bartenieff, I. Notes from Course in Correctives. New York City, NY: Dance Notation Bureau Press, 1977.
2. Bernard A, Strickler S. *Ideokinesis: A Creative Approach to Human Movement and Body Alignment*. Berkeley, CA: North Atlantic Books, 2006.
3. Calais-Germain B. *Anatomy of Movement*. Seattle, WA: Eastland Press, Inc., 2007.
4. Clippinger K. *Dance Anatomy and Kinesiology* 2nd ed. Champaign, IL: Human Kinetics, 2016.
5. Dowd I. *Taking Root to Fly: Articles on Functional Anatomy*. Northampton, MA: Contact Collaborations, Inc. Contact Editions, 1995.
6. Fitt SS. *Dance Kinesiology* (2nd ed.); New York, NY: Schirmer Books, 1996.
7. Floyd RT. *Manual of Structural Kinesiology* (19th ed.). New York, NY: McGraw-Hill Education, 2015.
8. Franklin E. *Dance Imagery for Technique and Performance*. Champaign, IL: Human Kinetics, 1996.
9. Franklin E. *Dance Alignment Through Imagery*. Champaign, IL: Human Kinetics, 2012.
10. Franklin E. *Relax your Neck Liberate your Shoulders*. Hightstown, NJ: Elysian Editions, Princeton Book Company, 2002.
11. Green-Haas J. *Dance Anatomy* (3rd ed). Champaign, IL: Human Kinetics, 2010.
12. Grossman G. *Dance Science*. Hightstown, NJ: Princeton Book Co., 2015.
13. Hackney P. *Making Connections: Total Body Integration*. Amsterdam, The Netherlands: Gordon and Breach, 1998.
14. Hanna T. *Somatics*. Cambridge, MA: Perseus Books, 1988.
15. Langford E. *Mind and Muscle*. Leuven/Apeldoorn, Belgium and Holland: Garant Uitgevers N.V., 1999.
16. Oatis CA. *Kinesiology: The Mechanics & Pathomechanics of Human Movement* 2nd ed. Baltimore, MD: Lippincott, Williams, & Wilkins, 2009.

17. Peterson J. *Dance Medicine*. Hightstown, NJ: Princeton Book Co., 2011.
18. Romita N, Romita A. *Functional Awareness: Anatomy in Action for Dancers*. New York, NY: Oxford University Press, 2016.
19. Sweigard LE. *Human Movement Potential*. New York, NY: Harper and Row, 1974.
20. Weineck, J. *Functional Anatomy in Sports*. Chicago, IL: Year Book Medical Publishers, 1986.

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