Shoulder Rehabilitation and Stabilization:
The creation of a rehabilitation brace for aid in shoulder dislocations.
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Abstract: Out of all the joints contributing to human motion, the shoulder joint acts as the most flexible. However, the increase in flexibility decreases stability, allowing the shoulder joint to account for 85 percent of all joint dislocations in the human body. The dislocation, depending on the degree of injury, may be fixed through physical rehabilitation or surgery followed by physical therapy. In most cases, a brace is needed to stabilize the shoulder due to the weakened surrounding ligaments and muscles. Physical therapy is then needed to return strength to the shoulder muscles and rotator cuff. Though there are many braces on the market today used for shoulder girdle support, none provide proper scapular support. The objective of this project is the development of a brace capable of providing support to the shoulder joint while having an integrated resistance system for rehabilitation. The provided support concentrates on scapular placement and shoulder girdle compression.

Design Characteristics: A broad search of all current shoulder braces on the market was conducted to determine any improvements that could be made on previous designs. Ultimately, my design concentration focused on the following issues:

- Shoulder compression/position
- Scapular Support

Dislocations: When there is an injury to the joint between the humerus and the scapula, a shoulder dislocation has occurred. During a dislocation, the humeral ball at the end of the humerus loses contact with the glenoid fossa and slips from the socket. A lack of stabilizer muscle development can also increase the risk of or be the initial cause of shoulder dislocation in certain cases.

Anatomy:

Dislocations:

- 1. supraspinatus
- 2. infraspinatus
- 3. teres minor
- 4. teres major
- 5. triceps (long head)
- 6. deltoid

Competing Designs: Three independent designs were created as a means of displaying the different methods of functional implementation. The varying ideas had varied levels of compression, support, and flexibility.

Design Implementation: Materials were chosen for the design based on materials associated with many of the medical braces currently on the market and those used in rehabilitation exercises.

- Perforated Neoprene
- Thera Bands of varying resistance levels
- Silicon Gel Insert
- Velcro attachments

Final Design and Prototype: The final design is a representation of all functional components. The brace offers compression around the shoulder girdle while securing correct posture and scapula placement. Adjustable resistance levels allow for increased flexibility as the joint and surrounding muscles are strengthened. Encapsulated silicon must still be added.