The Benefits of Incorporating Human Anatomy into Apparel Design Coursework

Susan L. Sokolowski, University of Oregon

Karen L. LaBat, University of Oregon

Anatomy is defined as "the study of structure" (McKinley & O'Louglin, 2006, p. 2). Apparel design students learn to base designs on some version of a body form: mannequin, two-dimensional sloper or pattern block to develop three-dimensional apparel to approximate a human body. A croquis, basic body outline, is often used as the basis for quickly generating apparel sketch ideas. All of these foundation forms focus on the external structure and surface of the body however, apparel is often designed to interface with the entire body, beyond its' external surface. Some examples include bras, sport products and Personal Protective Equipment (PPE).

We propose that all apparel designer students should have working knowledge of the internal structures of the human body—the anatomy—that determines the external structure. Beginning level courses can incorporate units and/or exercises on anatomical structures that influence the external form, structure, and size of the body. More advanced courses can focus on physiological functions of anatomy that influence human comfort, health, and performance. Anatomical systems include: skeletal, muscular, nervous, fat, respiratory, circulatory, lymphatic, digestive, urinary, reproductive, integumentary, and endocrine (LaBat & Ryan, 2019).

Basic concepts concerning the skeletal, muscular, and fat systems can be taught in beginning level courses. The skeleton provides the solid framework with joints linking separate bones. Joints provide key locations for joining apparel pattern pieces. For example, accurately shaping and locating the armscye of a bodice relies on identifying the acromion. Students can more easily visualize the acromion location by learning about the skeletal structure of the shoulder girdle. The acromion is a bony protuberance of the acromioclavicular joint. While designers may consider front (anterior) and side (lateral) views of the torso when designing a garment; understanding the multi-dimensional character of the spine can contribute to a designer's understanding and adjusting fit of a garment. The spine—made up of many stacked vertebrae with cushioning discs between each disc—is surprisingly mobile and greatly effects how products fit on the body. Mannequins and croquis with rigid hyper-erect forms currently do not reflect real human anatomy and can mislead students when working with special populations and real-life users.

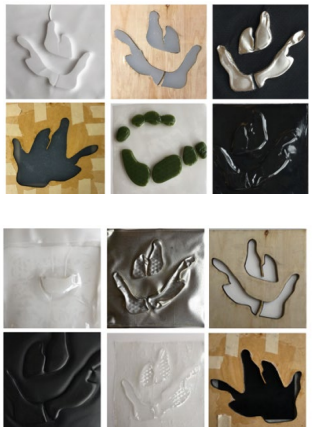
Designers can think of muscles and fat as adding to the framework of the skeleton to provide typical and individual body forms. Pattern drafting methods may specify measuring the circumference of the biceps. Understanding the location and skeletal attachments of the biceps provides more in-depth knowledge for locating and measuring the bicep muscle. Fat deposit locations, called fat patterning (Croney, 1971), influences fit and shape of apparel. Skeleton,

muscles, and fat patterning differs by gender and age. Understanding anatomical differences of a target market can aid in shaping apparel designs and appropriate grading more accurately.

Mid-level courses may incorporate knowledge on how systems interact. For example, incorporating motion into apparel designs is important especially for PPE or athletic apparel. Understanding motion requires knowledge of several systems. The skeleton, as in all apparel designs, provides foundational structure. Muscular and nervous systems act on the skeletal system to move the body, and nervous system structures initiate muscle motions. Apparel can be designed to allow optimum performance of the involved anatomical structures.

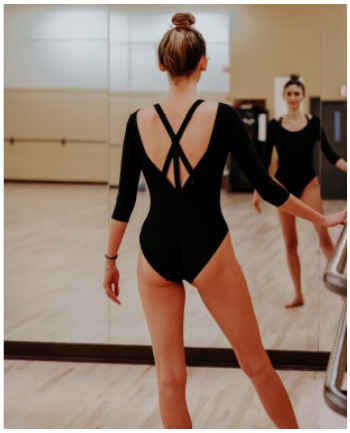
Advanced apparel design courses with an emphasis on design for function can delve deeper into anatomy and related physiology (Laing & Sleivert, 2002). For example, understanding human body responses to temperature extremes is necessary when designing protection for hot and cold environments. The sophisticated interactions of the nervous, respiratory, circulatory, and integumentary (skin) systems should be considered to when designing to provide maximum comfort and protection.

Some examples of student work, when anatomy is studied and considered through the design process are presented in Figure 1.



Road cycling glove materials ideation to reduce pressure while gripping

Space station bra concept based upon fluid & tissue changes in micro gravity



Ballet leotard design to activate the spine & shoulder when practicing

Figure 1. Apparel design student work influenced from human anatomy.

When design students learn about human anatomy, we have found their work to better grounded in research, and creatively more innovative, as they are comprehensively thinking about the anatomical systems that interface with the products they are developing. Our motivation of this

concept paper is to inspire conversation between ITAA members about the future needs of students studying apparel design, with the potential of workshop development for members in the organization regarding human anatomy.

References:

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