

The Vocal Athlete

Third Edition

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Foreword

In my first publication on voice, I noted that “singing is an athletic activity and requires good conditioning and coordinated interaction of numerous physical functions” (Sataloff, 1981). At that time, the care of voice patients and training of voice students was not particularly scientific or sophisticated. That changed rapidly, and a decade later, it was clear that “improvements were made possible by interdisciplinary collaborations among professionals, who, at first, barely spoke the same language” (Sataloff, 1992). When the concept of a “singing voice specialist” was introduced (Carroll & Sataloff, 1981), it was not only novel but also somewhat controversial. By 2014, when Plural Publishing produced the first edition of *The Vocal Athlete* by Wendy LeBorgne and Marci Rosenberg, substantial advances in knowledge and interdisciplinary teamwork had revolutionized the state-of-the-art in laryngology, speech-language pathology, and voice teaching. Their classic book was directed toward singing teachers of all genres, and it synthesized in accessible language core knowledge in anatomy and physiology, vocal health and fitness, voice pedagogy, and practical voice research.

The third edition of *The Vocal Athlete* is updated and expanded, including one new chapter on voice pathology and registration. It is admirably successful in filling a gap in traditional academic voice pedagogy. *The Vocal Athlete*, third edition, is grounded in solid science and practical experience. It will be an invaluable addition to the libraries of all singing teachers, speech-language

pathologists who work with voice patients, singing voice specialists, and acting voice specialists, and its information is equally valuable for laryngology fellows and laryngologists. Like the second edition, the third edition will become a classic.

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Preface

Meeting Industry Demands of the 21st-Century Vocal Athlete

Through our years of professional singing training and performance (resulting in an evolution to become voice pathologists and singing voice specialists), we have encountered a transition in the industry demands and injuries of the 21st-century vocal athlete. Today's commercial music industry demands the versatility of vocal athletes, who are now expected to be skilled in multiple singing styles. Not only are these singers asked to perform vocal gymnastics on an eight-show-per-week schedule, but these vocal athletes must also possess excellent acting skills and strong dancing abilities to be competitive. These demands on the voice, body, and psyche necessitate a physically, vocally, and mentally fit singer who is agile and adaptable.

In a time when major opera companies are closing their doors, the commercial music industry boasts millions of viewers every week through mainstream media outlets (e.g., *The Voice*, *American Idol*, *X-Factor*). According to Playbill.com, Broadway shows continue to generate record ticket sales, with shows like *MJ The Musical* grossing over \$150 million in revenue per week and other hit shows, including older favorites, still grossing \$2 million to \$3 million per week. When you consider that there are typically more than 25 shows on Broadway at any given time, in addition to another \$1.4 billion spent on years of national tours, the money spent by consumers on this genre

is staggering and continues to grow. In the pop music market in 2022 alone, the total revenue of the recorded music industry was reported at 31.2 billion dollars, indicating a strong public desire and potentially lucrative business for commercial music singers. Since the publication of the first edition in 2014, pedagogy programs focusing on contemporary commercial music (CCM) styles have emerged. However, there are still only a few vocal pedagogy training programs for CCM singing in the United States compared to classically focused programs. Therefore, these vocal athletes learn their craft by relying on talent; they make their way by imitation, or they study with a voice teacher who may or may not have experience or training in the commercial music genre. Unfortunately, some of these choices may lead to vocal problems if they cannot withstand the demands of the industry. By no means do we suggest that classical voice pedagogy is not a valid and proven effective method of vocal training, as it has hundreds of years of history and successes in the classical genre. However, even though running is part of a gymnastics floor routine, it would be unlikely that an Olympic gymnast would train exclusively with a running coach when required to perform backflips on a balance beam. This has become even more relevant as newer musicals continue to push the boundaries with shows like *Hamilton*, *Six*, *Hadestown*, *MJ*, and numerous other pop/rock musicals. With CCM vocal styles continuing to dominate and evolve, the need for teachers trained in this type of pedagogy continues to grow.

We developed this text to aid singers, singing teachers (of all genres), and voice

pathologists/clinical singing voice specialists in their understanding of vocal wellness, fitness, and training, providing a comprehensive background of the science and research behind how we learn and how we can maximize performance for longevity in a commercial music market. The third edition has been updated, revised, and expanded with numerous new references and a chapter on Black American Music and the influence of vocal pedagogy, making this book a truly comprehensive source for classical and contemporary teaching.

Section I has been restructured and introduces the Structure and Function of the Voice as it applies to vocal athletes. Chapter 1 presents the mechanics, structure, and function of the singer's body, incorporating the anatomy of the body framework and integrating movement and movement strategies for active performers. Chapter 2 details the central command center (neurological control) of the voice from both a physical and an emotional perspective. Included in Chapter 2 is information relevant to performance anxiety in vocal athletes. Chapters 3 and 4 are based on how we learn and acquire new skills, providing singing teachers (regardless of style) with invaluable information on maximizing teaching and learner outcomes. Chapters 5 and 6 go beyond typical anatomy and physiology of the respiratory and laryngeal mechanisms. These chapters incorporate relevant research and the functional utility of breath and sound production in the commercial music performer, including topics on how dancers who sing use different breathing strategies and information on vocal fold vibration patterns in high-demand voice users. Chapter 6 is expanded for the third edition, including contemporary theories on laryngeal mechanics and singing. Chapter 7 establishes a basic understanding of vocal acoustics and resonance, providing singers

and teachers with a user-friendly chapter on these often challenging topics using relevant singing illustrations. This chapter is also greatly expanded for the third edition, incorporating concepts of acoustic pedagogy for CCM singers.

As vocal health and fitness are paramount for amateur and elite vocal athletes for long-term careers, Section II is devoted to providing a unique perspective on relevant topics for vocal athletes. Section II includes an expanded Chapter 8, which details the impact of phonotrauma on the vocal folds and provides insight into wound healing and injury prevention. Next, Chapter 9 provides a comprehensive review of common vocal pathologies found in singers. Additional invited contributions include the impact of reflux on the singer (Chapter 10), what singers need to know when undergoing anesthesia (Chapter 12), and team members' roles on a multidisciplinary voice care team (Chapter 11). The Life Cycle of the Voice (Chapter 13) provides an overview of the changes that happen to the singing voice throughout the life span, with specific attention to singers under the age of 40 years who populate the commercial music scene. Current information on our understanding of gender affirmation treatments and potential implications for singers is included in several chapters. Chapter 14 confirms and dispels many of the common old wives' tales related to vocal health and hygiene, including tradition and alternative medical therapies.

The final section of this text (Section III) includes six unique chapters. These chapters span a review of both classical and commercial pedagogy (Chapters 15, 16, 18, and 19) and the scientific studies on the impact of belting on elite and student performers (Chapter 19). The assumption that traditional classical pedagogy can support any style of singing is inconsistent with

what singing science research is now showing about physiological differences between classical and CCM styles of singing. New to the third edition is a long-awaited, comprehensive chapter by Trineice Robinson-Martin and Alison Crockett on Black American Music and its influences on vocal pedagogy (Chapter 17). The book concludes with an updated chapter on audio technology (Chapter 20) and the understanding and use of current technology (e.g., microphones, sound boards, monitors) by every teacher and singer who sings in a commercial style.

Few, if any, pedagogy books incorporate this breadth of information covering contemporary pedagogy, vocal wellness, and fitness into one text, making it a comprehensive resource for a vocal pedagogy course. We created a reference grid that aligns the content in *The Vocal Athlete*, third edition, to the new, standardized vocal pedagogy curriculum for both one- and two-semester courses as recommended by the National Association of Teachers of Singing (NATS). Additionally, on this grid, we included how *The Vocal Athlete* aligns with the 19 topic areas covered on the written examination for the Pan American Vocology Association–Recognized Vocologist (PAVA-RV) distinction for those using this text as a resource for preparation (see following page).

We would be remiss to exclude functional exercises to develop and train the concepts discussed in this text. Therefore, over 100 exercises from expert teachers all over the world are included in the sister workbook: *The Vocal Athlete: Application and Technique for the Hybrid Singer*, Third Edition (Rosenberg & LeBorgne, 2026). Many of these exercises accompany and parallel the concepts presented in this textbook.

Whether at the professional or novice level or somewhere in between, there are limited resources for training commercial vocal styles relative to the number of singers who desire to sing them. This book aims to provide scientifically based information without usurping the art of singing pedagogy to provide 21st-century hybrid singers with a guide toward their goal of becoming proficient and healthy CCM vocalists. This brings us back to the necessity for sound vocal instruction and technique to allow these singers to use their voices as safely as possible and to promote vocal health in this group of singers who may already be at high risk for encountering vocal problems. This is now more important than ever, as in reality, musical theater and other CCM styles will continue to raise the bar. Composers will continue to be commissioned to write shows that will make money, especially during current economic strains when there is less willingness to finance works that do not ensure financial payoff. Therefore, singers will continue to be asked to “defy gravity” and generate more complex vocal acrobatics to stay employed. Ultimately, the CCM vocal athlete and teachers are charged with the task of providing voice students with a sound pedagogical technique that will (a) serve them well in their chosen vocal style, (b) allow the singer to cross over to varied vocal styles as demanded, and (c) promote vocal longevity and health.

hy•brid sing•er (n). Refers to the vocal athlete who is highly skilled, performing in multiple vocal styles, possessing a solid vocal technique that is responsive, adaptable, and agile to meet the demands of current and ever-evolving vocal music industry genres.

1-SEMESTER 15 WEEK	NATS RECOMMENDED TOPIC DAY 1 <small>* some supplemental materials may be req.</small>	NATS RECOMMENDED TOPIC DAY 2	VOCAL ATHLETE 3RD ED.	2-SEMESTER 15-WEEK W/ PRACTICUM	NATS RECOMMENDED TOPIC DAY 1	NATS RECOMMENDED TOPIC DAY 2	VOCAL ATHLETE 3RD ED.	PAVA-RV VOCALOGY EXAM TOPIC AREAS	VOCAL ATHLETE 3RD ED
1	OVERVIEW OF SYLLABUS/INTRO VOCALOGY* HISTORY OF VOCAL PED	HISTORY OF VOCAL PED CONT/METHODS OF TEACHING	<small>Chapter location(s) see Table of Contents</small> CHAPTER 16 CHAPTER 17	1	UNCHANGED	"	"	BASIC VOICE ANATOMY	CHAPTERS 1,2,5,6
2	EAR & HEARING *	LISTENING & PERCEPTION *	CHAPTER 15	2	UNCHANGED	"	"	BIOMECHANICS & MUSCLE PHYSIOLOGY	CHAPTERS 1,2,5,6 & 4
3	BODY ALIGNMENT, AWARENESS, POSTURE & MOVEMENT	RESPIRATION & BREATHING	CHAPTER 1 CHAPTER 5	3	UNCHANGED	"	"	BREATHING & AERODYNAMICS	CHAPTER 5
4	RESPIRATION & BREATHING	ANATOMY AND PHYSIOLOGY (A&P) PHONATION & LARYNX	CHAPTER 5 CHAPTER 6	4	UNCHANGED	"	"	LARYNGEAL CHANGES THROUGH LIFESPAN	CHAPTER 11
5	ANATOMY AND PHYSIOLOGY (A&P) PHONATION & LARYNX	REGISTRATION	CHAPTER 6 CHAPTER 15 CHAPTER 16	5	UNCHANGED	"	"	BASIC VOICE ACOUSTICS	CHAPTER 7
6	SOUND/ACOUSTICS	RESONANCE, SINGING VOICE ACOUSTICS, PSYCHOACOUSTICS *	CHAPTER 7 CHAPTER 19	6	UNCHANGED	"	"	FUNDAMENTAL HZ, REGISTER, VIBRATO	CHAPTER 6,7,15,19
7	RANGE/VOICE CLASSIFICATION	ARTICULATION * A&P	CHAPTER 15 CHAPTER 1	7	UNCHANGED	"	"	INST. FOR VOICE ANALYSIS *	* Not addressed
8	MOTOR LEARNING/ SKILL ACQUISITION	LIFESPAN OF VOICE:EARLY THROUGH LATE	CHAPTER 3 CHAPTER 13	8	UNCHANGED	"	"	PERCEPTION OF VOCALIZATION PSYCHOACOUSTICS,PHONETICS*	CHAPTER 7
9	VOICE HEALTH & HYGIENE	DEVELOPMENTAL* WARM-UP VOCALISES	CHAPTERS 8-14 CHAPTER 4	9	UNCHANGED	"	"	CHORAL & ENSEMBLE *	* Not addressed
10	DEVELOPMENTAL REP. SELECTION *	TEACHING PRACTICE SKILLS/ EXERCISE SCIENCE	CHAPTER 4,13	10	DEVELOPMENTAL EXERCISES & VOCALISES	VIBRATO	CHAPTERS 4 & 6	AMPLIFIED SINGING IN CCM STYLES	CHAPTERS 15,17,18,19, &20
11	STUDIO COMMUNICATION, STUDENT-TEACHER RELATIONSHIPS, TEACHING PHILOSOPHY, NATS CODES OF ETHICS	PRACTICUM	* Not addressed	11	DEVELOPMENTAL REP SELECTION	TEACHING PRACTICE SKILLS EXERCISE SCIENCE	CHAPTER 4	VOICE HABILITATION & UN AMPLIFIED SINGING IN CLASSICAL STYLE *	CHAPTERS 6,7,15,16
12	ONLINE TEACHING	PRACTICUM	* Not addressed	12	ONLINE TEACHING	RESEARCH METHODS	* Not addressed	MOTOR LEARNING	CHAPTER 3
13	RESEARCH METHODS	PRACTICUM	* Not addressed	13	TECHNOLOGY & VOICE ANALYSIS	STUDIO COMMUNICATION, STUDENT-TEACHER RELATIONSHIP	CHAPTER 20	VOICE FOR THE ACTOR * TRANSGENDER VOICE *	CHAPTER 13
14	TECHNOLOGY * VOICE ANALYSIS*	PRACTICUM	CHAPTER 20	14	TEACHING PHILOSOPHY/NAT S CODE OF ETHICS	METHODS FOR TEACHING GROUP VOICE	* Not addressed	PRIMAL ANIMAL VOCALIZATION	* Not addressed
15	PRACTICUM- GROUP VOICE	PRACTICUM-ONLINE PRE-RECORDED	NA	15	FLEX WEEK/MAKEUP	FLEX WEEK/MAKEUP	NA	VOICE HYGIENE, VOICE DISORDERS/REHAB	CHAPTERS 8,9,10,11,12, 13,14
				SEMESTER 2 DEDICATED TO PRACTICUM & OBSERVATION	"	"	NA		



The Singer's Body: Alignment, Movement, and Intention

Introduction

Posture and alignment are among the foundational principles of good singing. Often, the first impression of a performer is what the performer is conveying via their body and stance before we hear any sound. Vocal pedagogy emphasizes body alignment during singing, and most singers understand the vital role that posture/alignment plays in optimal voice production and efficiency. Fortunately, voice and acting students have benefited from varying bodywork modalities such as Alexander Technique, Feldenkrais, and Pilates, using these to help establish and reinforce optimal musculoskeletal alignment and function at the most basic neuromuscular level.

Efficient use of the singer's body extends beyond good posture. Tensegrity, described below, allows for optimal balance and integrity of the skeletal system, allowing for a multitude of movements and

positions. In many singing styles, including musical theater, pop, and opera, movement and/or dancing are incorporated into the performance. The singer's task is to use the movement or dancing efficiently to serve the singing productively so that the two occur synergistically instead of working against one another. The singer often manages restricting costumes, shoes, moving set pieces, a raked stage, and pyrotechnics. Yet, voice lessons typically occur in a static environment with limited movement space. As a result, many singers learn to sing with good posture and alignment while standing somewhat still within the confines of the voice studio. However, they are often left to their own devices to navigate movement, choreography, and costumes when in a performance venue. This chapter discusses the basic anatomical and physiological principles of posture and alignment and the dynamic nature of the human body. It also gives readers an overview of the many complementary and often essential methods

used by many singers and actors to facilitate optimal voice production and performance when the desired alignment may be compromised. Relevant research findings on posture and alignment, as they relate to the vocal athlete, are reviewed.

Kinesthetic Awareness and the Mental Rolodex

Kinesthetic awareness refers to one's own ability to sense what a body part is doing relative to the environment in which it exists. Our nervous system uses sensory feedback along with our movement to help orient us (Gilman, 2014). If we stand with our eyes closed, we are aware of how we are standing, the symmetry of our feet, the position of our head relative to our shoulders, and so on. If we lift our hand over our head, we have a strong sense of what is happening even with our eyes closed because we have a strong reference for this sequence of movements based on life experience. In this text, these authors refer to a "mental Rolodex," which is our brain's personal filing cabinet or neurological representation or catalog of our "movement options. This catalog was established when we were born and continues to update on a regular basis based on our life experiences. This mental Rolodex, or somatic road map, contains millions of options for movement combinations. Many of these options do not necessarily serve us well, yet they have developed over time and been reinforced for various reasons. Additionally, these movement patterns may even feel "normal" to us.

It is typically easier to learn a completely novel movement task than to "unlearn" an inefficient but habituated movement pattern (Gilman, 2014). Further,

Feldenkrais® methodology holds that the body organizes around this somatic reference. This body map is wired into our nervous system, and we produce movement according to these reference points. Therefore, if we have inaccurate somatic maps, our movement catalog (mental Rolodex) is limited. Feldenkrais stated, "We act in accordance with our self-image."

This concept holds true for both productive and nonproductive movements. If our vocal self-image has limited options, then our capabilities will be limited. Along with this thinking, any training for voice should keep this in mind, incorporating this holistic approach into the studio. Training can be more efficient when the emphasis is on experiential learning and the "how" of movements (Nelson & Blades-Zeller, 2002). The process is what is essential, not the product. High numbers of repetitions are not necessarily the goal, and fast is not always better. In fact, slower typically gets you there faster. This concept often gets left by the wayside in a culture where speed and efficiency are valued for completing tasks. Additionally, teachers working in academic settings often have benchmarks they must meet each semester, requiring them to prioritize "product" over "process." Along with learning expectations and benchmarks, voice training should be student centered and often student guided (see Chapter 3).

In recent years, more information has been available on trauma and its potential impact on a multitude of things, including items focused on physicality. This topic is important to understand, and while beyond the scope of this book, voice trainers of any kind must educate themselves on trauma-informed teaching, understanding when something falls outside of their scope of competence, and knowing when to refer out to the appropriate professionals.

Slower gets you there faster.

Learning should emphasize the **process** over the product.

Tension Versus Release

In her book *Voice Work: Art and Science in Changing Voices*, Christina Shewell defines tension as “a physiological state of muscle fibers, which can vary in the degree to which they are contracted and tight or longer and relaxed” (Shewell, 2009, p. 113). She differentiates release from tension release, which she describes as a conscious undoing. We require various degrees of tension to exist; otherwise, we would be unable to maintain structure. In voice training, we often focus on establishing the correct balance of tension and release. This can be challenging in an endeavor that is incredibly dynamic, especially for the contemporary commercial music (CCM) performer.

Tensegrity

Tensegrity is a combination of tension and integrity. In engineering, this concept is applied to building sound structures like a bridge. In pedagogy, the structure is the human body. The bones provide the support beams with an intricate system of levers and pulleys, allowing for numerous positions and movements (Earls & Myers, 2010; Myers, 2014). In tensegrity, the structure's integrity stems from the network of interwoven tensile forces and is directly impacted by the balance of the tensional forces imposed on it. Therefore, tension

and integrity exist symbiotically. As humans, we can jump, leap, and turn upside down, all while maintaining tensegrity. Within this structure, the body will default to distributing effort more globally rather than containing it locally. Global distribution of effort can make us more efficient; however, strain can also be distributed globally. When we impose specific demands on our bodies over an extended period, remodeling can occur. This remodeling can occur at the level of the bone, as is the case with a dancer. Other connective tissues and muscles can also remodel in response to demand (Earls & Myers, 2010). This remodeling can be productive, helping to optimize a specific movement demand. Still, it can also be counterproductive, as seen with some of the newer musculoskeletal issues associated with “tech neck.”

Posture refers to our stance or shape in a particular position (seated, lying, standing).

Alignment refers to the relationship of our body parts to one another within our body. (Shewell, 2009)

Posture and Alignment

Consider what comes to mind when you think of your posture. Take a moment to stand erect and notice what you feel. What, in your mind, holds you upright? Do you balance on the balls of your feet, the heel, or on the center? Where do your ears lie relative to your shoulders? Are your shoulders symmetrical? Is your chest collapsed, in a military stance, or neutral? How does your head feel balancing on your cervical

spine? Are you actively holding your head up? Do you notice that you engage your neck strap muscles to assist in holding your head up? Now sing a short phrase of “Happy Birthday.” Does your posture and/or muscular awareness change when singing is introduced? Physical awareness of the body during singing is essential to maintain freedom and ease of both the voice and the body. The singing student may not be aware of how the body is designed, yet having a general understanding of the anatomy and physiology of the musculoskeletal system and the potential impact that postural changes have on vocal output is an important part of learning good vocal technique.

Skeletal Structures

Put simply, the role of the skeleton is to provide the framework for the body and provide a place for the origin or attachment of muscles. It is designed to efficiently distribute weight and work so that we can move freely without significant effort. When out of balance, the body system works less efficiently, and voice production can be compromised. This section highlights some typical locations for physical misalignment and concession of vocal technique as a result. Figure 1–1 shows a lateral view of the human skeleton. The figure was adapted for *What Every Singer Needs to Know About the Body* (Malde et al., 2009). Malde’s book provides an extended resource for singers of all styles and is recommended for further reading regarding posture, alignment, and body mapping. The authors discuss in detail the six places of balance to facilitate optimal freedom of the body during singing. Imagine a vertical line traveling from the head to the feet. The six places of balance, as

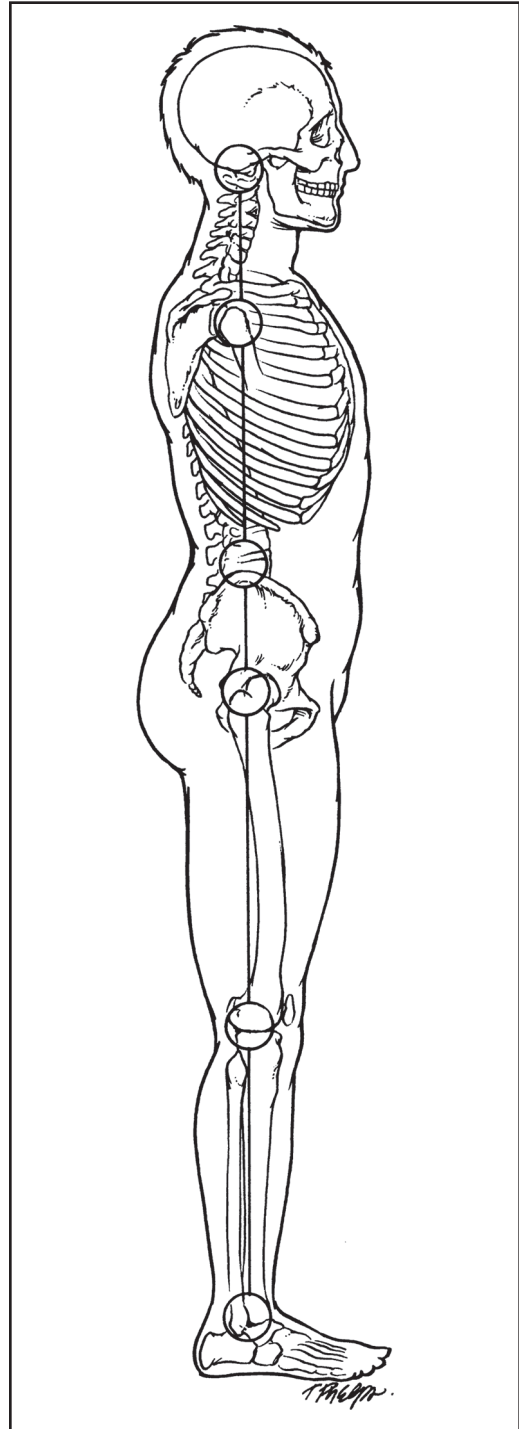


Figure 1–1. Skeleton showing places of balance, side view. By T. Phelps. Copyright 2008. Used with permission.

described by Malde and colleagues (2009) include (a) atlanto-occipital (A-O) joint, (b) arm structure, (c) thorax/lumbar spine, (d) hip joints, (e) knee joints, and (f) ankle joints. These areas all have dense sensory input to provide tactile feedback about how the body is moving.

The human head accounts for approximately 8% of the entire body mass and can average 6 to 10 pounds. Adding a headpiece, wig, or mask will easily add a few more pounds for the cervical spine to support. The first cervical vertebra, called the atlas, supports the head, and this joins the bottom of the skull at the occiput via the A-O joint, which is the first of the six places of balance. This is a critical juncture because proper head alignment onto the cervical spine allows for freedom of movement of the head and neck without extraneous involvement of the neck strap muscles. Tech neck is a newer phenomenon related to the shift in postural habitus to a more rounded back with a hanging head while looking at our mobile phones and computers.

The Spine

The spine and its attachments provide the body's skeletal framework. It is made up of 34 irregularly shaped bones, which collectively comprise the cervical, thoracic, lumbar, sacral, and coccygeal aspects of the spine (Hoit et al., 2022).

Cervical Spine

When aligned, the A-O joint marks the middle of the skull. Figure 1–2 shows the head centrally aligned on the cervical spine. The cervical spine extends from the base of the skull down to the thoracic spine. The uppermost seven vertebrae of the spinal column make up the cervical spine (C1–C7). The role of the cervical spine is to support the head. The first two vertebrae (C1 and C2) allow for rotation of the neck (right and left), while C5–C7 allow for flexion (forward) and extension (backward). This portion of the spine houses and provides protection to the upper portion of the spinal cord.

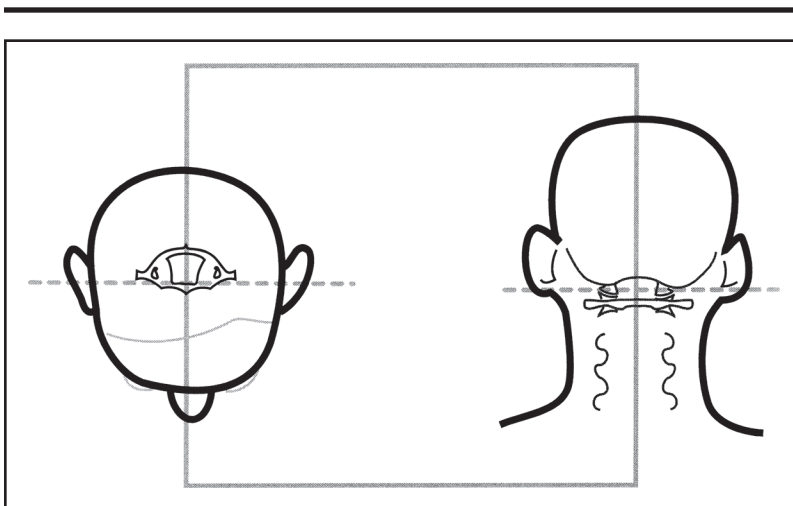


Figure 1–2. Atlanto-occipital joint location. By Conable. Copyright 2001. Used with permission.

Thoracic and Lumbar Spine

The thoracic spine refers to the upper and middle back. There are 12 vertebrae on the thoracic spine (T1–T12). Unlike the cervical spine, which is designed to be flexible, the thoracic spine trades flexibility for strength and stability to hold the body upright. The ribs are paired, with 12 ribs on each side. They emanate from the spine and slope downward along the sides of the torso toward the front, adding a rounded shape to the upper portion of the skeletal structure. The ribs are connected at each level of the thoracic vertebrae, providing a protective cage for the lungs, heart, and

other essential organs. The costal cartilage (Figure 1–3) connects the ribs to the sternum (breastbone). The sternocostal joints connect the cartilaginous portion of ribs 2 through 6 to the sternum. The expansion we can achieve with the ribs during inhalation is in part related to the pliability of the costal cartilage. The costal cartilage will ossify (become more bonelike and less flexible) as we age. Thus, rib cage expansion is decreased during the aging process.

The lumbar spine (see Figure 1–3) is commonly referred to as the lower back, consisting of five vertebrae, allowing for flexibility of this part of the spine. The vertebrae in the spinal column connect with

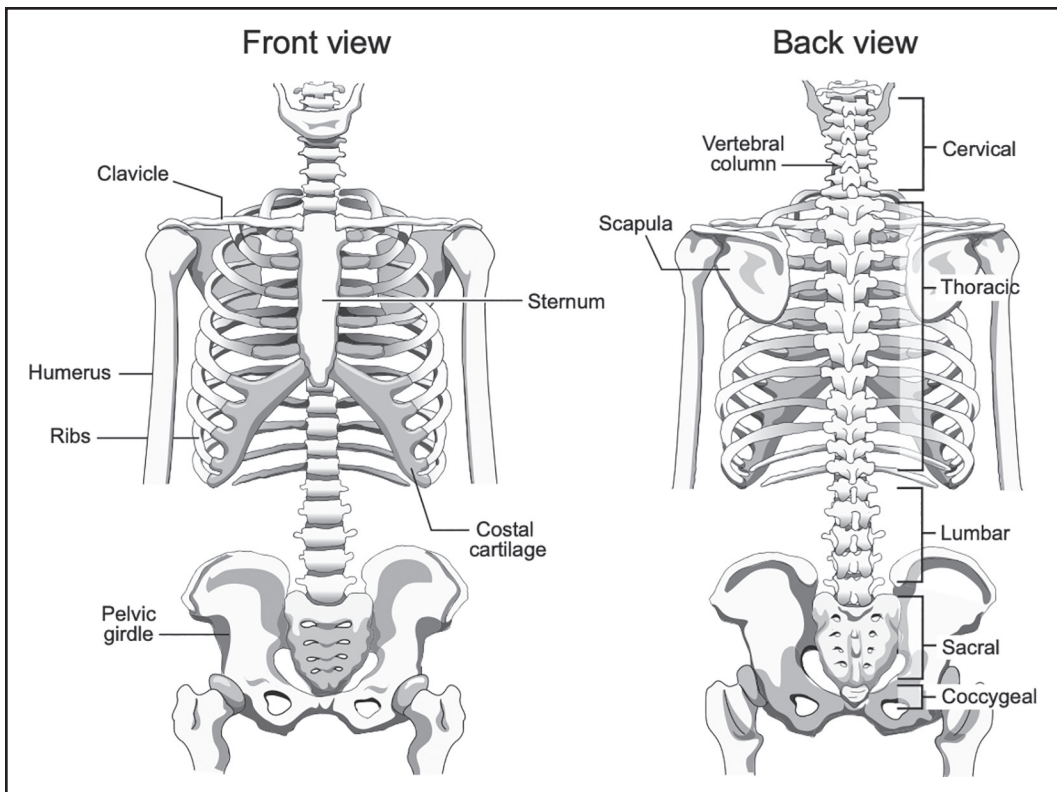


Figure 1–3. The skeletal framework of the respiratory system consisting of the clavicles, ribs, sternum, pelvic girdle, scapulae, and vertebral column. From *Foundations of Speech and Hearing: Anatomy and Physiology* (2nd ed.), by J. D. Hoit, G. Weismer, and B. Story, 2022, Plural Publishing. Reprinted with permission.