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FUNCTIONAL METHOD OF PREGNANCY SUPPORT

A Trimester-Adapted Protocol for the Integration of Breathing Control, Functional Loading, and Nutritional Support

METHODICAL RECOMMENDATIONS

Anastasiia Shapovalova

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Methodical recommendations
for obstetricians-gynaecologists, perinatal physiotherapists, prenatal trainers, nutritionists and adaptive physical culture specialists

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The method examines a trimester-adapted protocol for functional support during pregnancy that combines breathing control, targeted physical activity, and nutritional support into a unified system for managing a woman during gestation. The relevance of the work is determined by the growing interest in prenatal physical culture, amid a persistent shortage of protocols that account for the biomechanics of pregnancy, the dynamics of intra-abdominal pressure, the condition of the pelvic floor, and the metabolic demands of each trimester. The aim of the method is to develop a reproducible model that will create an integrated breathing, movement, nutrition system in which each element is functionally linked to the others and adapted by trimester, making it possible to connect 360° breathing, functional movement patterns, condition screening, and dietary correction within the framework of safe practice. The scientific novelty lies in integrating a breathing algorithm, a pre-training assessment matrix, principles of load progression, and trimester-specific nutritional combinations. The main conclusions indicate that controlling breathing and intra-abdominal pressure reduces the risk of diastasis and pelvic floor dysfunction, while the staged modification of exercises and diet support the body's adaptive resources throughout physiological pregnancy. The method will be useful for obstetricians-gynecologists, specialists in adaptive physical culture, coaches, rehabilitation professionals, and pregnant women.

Keywords: pregnancy, 360° breathing, intra-abdominal pressure, pelvic floor, diastasis, prenatal physical culture, functional training

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CONTENTS

INTRODUCTION

Obstetrics and prenatal physical culture are moving away from outdated dogmas that postulated pregnancy as a fragile condition requiring restriction of motor activity (Worska et al., 2025). The problem nonetheless remains relevant, since unfounded hypodynamia is often replaced by non-adapted fitness, which treats a pregnant woman as a person with excess body weight and ignores the complex cascade of physiological changes (Rudin et al., 2021). Pregnancy is a unique evolutionary process of bodily adaptation that requires functional support. Standard approaches demonstrate inadequacy. Complete rest aggravates the risks of gestational diabetes mellitus, sarcopenia, and preeclampsia, whereas aggressive training provokes severe forms of diastasis recti and pelvic floor muscle dysfunction because of incompetent distribution of mechanical stress (Paulsen et al., 2023).

The aim of this method is to provide specialists and patients with a reproducible, scientifically grounded protocol for functional support during pregnancy. This protocol is intended to combine breathing management and intra-abdominal pressure regulation with trimester-specific physical loading and targeted nutritional support. The implementation of this aim enables the transfer of prenatal training from the category of intuitive practices into the domain of evidence-based biomechanics and physiology.

The methodology is based on five basic principles that form the architecture of each training session. The first principle is the postulate that all movements must be initiated and controlled by breathing. Respiratory excursion sets the rhythm of muscle contraction and relaxation. The second principle is the control of intra-abdominal pressure. The regulation of the intra-abdominal pressure vector is the principal factor in preventing injury to the connective tissue of the anterior abdominal wall and the pelvic floor.

The third principle is functional loaded. It is important that not just muscles are isolated and trained' but also that the body is accustomed to the movements made’ such as bending over’ lifting weights or balancing. The fourth principle says that the starting positions’ amplitudes and points of support should vary according to the trimester of the fetus’s growth. The fifth principle is the integration of nutrition and recovery, in which nutrients are considered as specific biochemical cofactors of muscle work and regeneration.

The central idea of this guide conveys the philosophy of a safe, highly functional pregnancy that excludes both physical overload and psychological fear of movement. After studying this material, the reader receives a step-by-step algorithm for managing a pregnant woman at any stage of gestation. The guide provides ready-made training protocols, including analyses of seven exercises for each trimester, as well as extended nutritional recommendations integrated into the system for condition assessment and operational decision-making.

The structure of the manual follows the principle from theory to practice. The first chapter reveals the physiological prerequisites of changes in the woman’s body. The second chapter is devoted to the biomechanics of breathing and intra-abdominal pressure. The third chapter describes the testing and progression system. Chapters four through six contain comprehensive descriptions of trimester-based training protocols. The seventh chapter synthesizes the obtained data into a unified model of nutritional support and concludes with a final summary. The procedure for working with the manual presupposes the sequential implementation of diagnostic algorithms followed by the adaptation of the proposed exercises to the individual characteristics of a particular patient.

CHAPTER 1. PHYSIOLOGICAL CHANGES DURING PREGNANCY AND THEIR INFLUENCE ON MOVEMENT AND NUTRITION

1.1. Key Changes by Trimester

The period of pregnancy is accompanied by neurohumoral, biomechanical, and metabolic transformation (Daneau et al., 2025). The musculoskeletal system undergoes the most visible and clinically significant changes. As the fetus grows and the uterine mass increases, the body's overall center of gravity shifts steadily toward the ventral side. This process causes a cascade of compensatory postural reactions. Anterior pelvic tilt increases. Lumbar lordosis deepens. Cervical lordosis and thoracic kyphosis increase to maintain balance (Popajewski et al., 2024). The situation is complicated by endocrine restructuring, particularly the exponential rise in relaxin concentration. Relaxin, acting synergistically with estrogens and progesterone, initiates remodeling of collagen fibers, which leads to softening of the ligamentous apparatus. This is an evolutional adaptation for the pelvic ring's childbirth readiness' which sacrifices the passive stability of the sacroiliac joints and the pubic symphysis' and the role of maintaining stability is handed over to the muscular apparatus (Kamisan Atan et al.' 2021).

The respiratory system also undergoes major topographic and functional changes as a consequence of the growing uterus: the mechanical compression of the abdominal contents moves the dome of the diaphragm cranially upwards by four to five centimeters (Nassikas et al., 2021). Decreased functional residual capacity' decreased expiratory reserve volume' and the widening of the subcostal angle and the decrease in the lower ribcage's circumference and excursion work together during hyperventilation' meeting the 20 percent increase in oxygen demand by breathing more lightly and rapidly.

Progesterone further increases the respiratory center's sensitivity to carbon dioxide, thereby stimulating hyperventilation (Filipec & Đurin, 2025).

The cardiovascular system responds to the demands of the fetoplacental complex with massive hyperdynamia. Circulating blood volume increases by forty to fifty percent, predominantly because of plasma expansion, which leads to physiological hemodilution (Obianeli et al., 2024). Cardiac output increases by one third, while heart rate rises by ten to fifteen beats per minute even

Table 1

Systemic physiological adaptations by trimester of pregnancy

Trimester	Musculoskeletal system	Respiratory system	Cardiovascular system	Digestive system / metabolism
I	Increased relaxin levels, reduced ligamentous stability	Progesterone-mediated hyperventilation	Beginning in crease in blood volume and heart rate, reduced vascular resistance	Nausea, dyspepsia, appetite fluctuations, slowed intestinal motility
II	Forward shift of the center of gravity, increased pelvic tilt and lumbar lordosis	Elevation of the diaphragm, altered breathing mechanics	Increased cardiac output and circulatory load	Persistent slowed gastrointestinal motility, rising intra-abdominal pressure
III	Maximal postural adaptation, increased load on the lower back and pelvis	Reduced respiratory volumes, more shallow breathing	Blood voume +40–50%, higher heart rate, risk of hypotension and inferior vena cava compression	Heartburn, constipation, mechanical compression of abdominal organs

at rest (Long et al., 2021). Reduced systemic vascular resistance and mechanical compression of the inferior vena cava in the supine position increase the risk of orthostatic hypotension, dizziness, and marked peripheral edema, requiring revision of starting positions in the training process (Javier et al., 2023).

The digestive system and overall metabolism also do not remain intact. In the first trimester, under the influence of chorionic gonadotropin and progesterone, dyspeptic phenomena, nausea, and sharp appetite fluctuations often develop (Gangakhedkar, 2022). Progesterone-induced smooth muscle relaxation slows intestinal peristalsis (Rondanelli et al., 2025). In the third trimester, mechanical pressure from the uterus on the gastrointestinal tract can cause heartburn and constipation (Zakaria et al., 2022). The hormonal background influences emotional state, lowers fatigue thresholds, and requires the implementation of energy-conserving movement protocols (Jia et al., 2025). Systemic physiological adaptations by trimester of pregnancy are shown in Table 1.

1.2. Why Pregnancy Requires a Specific Training Method

Attempts to adapt standard fitness protocols to the needs of pregnant women by simply reducing the weight or the number of repetitions are conceptually erroneous. Traditional training systems were constructed without consideration of the phenomenon of progressive center-of-gravity shift and, more importantly, without understand- ing the dynamics of intra-abdominal pressure under conditions of hormonally altered connective tissue (Haworth & Hawcroft-Hurst, 2025). Pregnancy is not a pathology. It forms a different biomechanical landscape that requires a conscious approach to stress dosing.

Standard fitness protocols that include conventional crunches, planks, and heavy barbell squats can lead to excessive intra-abdominal pressure (Dolenec et al., 2022). Under normal conditions in a non- pregnant woman, this pressure is distributed evenly and buffered by the strong structures of the muscular corset. During gestation, the linea alba undergoes major mechanical stretching and increases to one hundred fifteen percent of its original length, while its collagen matrix softens under the action of estrogens and relaxin (Cavalli et al., 2021). The use of exercises that elevate intra-abdominal pressure results in a hydraulic impact vector directed into this weakened zone. This mechanism is a direct cause of pathological diastasis recti and hernias of the linea alba and umbilical ring.

Excessive pressure that is not compensated by adequate diaphragmatic function is directed caudally and exerts a destructive effect on the pelvic floor muscles. Given that the pelvic floor is already subjected to continuous gravitational stress from the mass of the fetus, amniotic fluid, and placenta, additional compression during non-adapted training multiplies the risks of stress urinary incontinence and pelvic organ prolapse in the postpartum period (Çiçek et al., 2024).

The biomechanical risks of using non-adapted training protocols during pregnancy are shown in Figure 1.

Thus, the specificity of training during pregnancy lies in teaching the nervous system the skills of pressure vector redistribution, which renders classical fitness in its original form inapplicable.

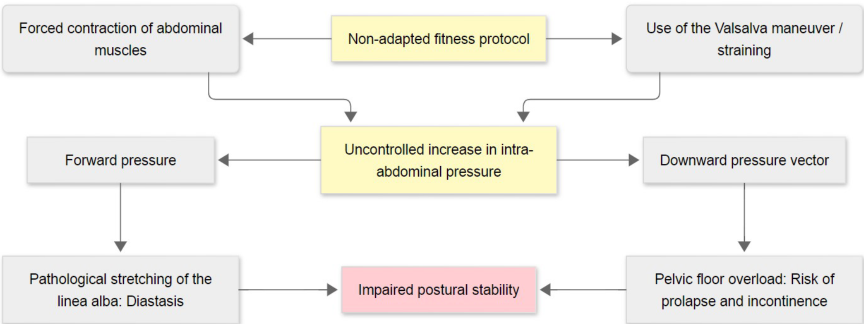

Fig. 1. Biomechanical risks of using non-adapted training protocols during pregnancy

CHAPTER 2.
360° BREATHING AND INTRA-ABDOMINAL PRESSURE CONTROL: THE FOUNDATION OF THE METHOD

2.1. The Concept of 360° Breathing

The foundation of the developed method is the concept of three-dimensional 360° breathing. The mechanism of this breathing pattern lies in the conscious direction of inspiratory airflow into the lateral and dorsal posterior regions of the rib cage. In contrast to the popular yet physiologically incorrect belly breathing during gestation, which overstretches the already overloaded anterior abdominal wall, 360° breathing activates the lower ribs via the bucket-handle principle (Chen et al., 2025). During inhalation, the ribs gently separate to the sides and expand in the back, creating optimal lung volume without aggressive protrusion of the abdomen.

The importance of breathing control during training has a deep physiological basis. The diaphragm is inseparably connected to the transverse abdominal muscles and the pelvic floor muscles via myofascial chains. This structure functions as a single piston (Atkın, 2024). During correct three-dimensional inhalation, the diaphragm descends and evenly distributes pressure in the abdominal cavity, triggering a gentle, reflexive eccentric lengthening of the pelvic floor muscles. The use of 360° breathing helps avoid fetal hypoxia, ensures continuous venous return, and provides a safe, shock-absorbing mechanism for the spine during any motor act. A comparative analysis of breathing patterns and their biomechanical impact on a pregnant woman is presented in Table 2.

Table 2.

Comparative analysis of breathing patterns and their impact on the biomechanics of a pregnant woman

Characteristic	Clavicular, Stress Breathing	Isolated Belly Breathing	360° Breathing-Pattern, Method
Primary Musculature	Scalene muscles, sternocleidomastoid, upper trapezius	Respiratory diaphragm, anterior portion, abdominal wall muscles	Diaphragm, all portions, intercostal muscles, transverse abdominis
Expansion Vector	Vertical, elevation of shoulders and clavicles	Sagittal, forward protrusion of the abdominal wall	Three-dimensional, lateral and posterior expansion of lower ribs
Effect on Intraabdominal Pressure	Minimal, but causes cervical overstrain and hypoxia	Creates excessive forward pressure vector, promoting linea alba stretching, diastasis	Evenly distributes pressure, reducing load on pelvic floor and spine

2.2. Control of Intra-abdominal Pressure

To understand the importance of pressure control, it is necessary to introduce the concept of the abdominal cylinder. In this model, the abdominal cavity is a hydraulic cylinder in which the diaphragm functions as a mobile roof, the pelvic floor as an elastic base, the transverse abdominal muscle as a tightening corset in front, and the multifidus muscles as stabilizers posteriorly. The synchronous functioning of these structures ensures spinal stability and protection of the internal organs.

The risks of excessive intra-abdominal pressure during training arise when this synchronization is disrupted. If a woman exerts effort during inhalation or holds her breath, intra-abdominal pressure increases sharply. Since fluid is incompressible, pressure seeks a weak link. During pregnancy, these weak links are the stretched linea alba and the softened pelvic floor. Signs of pathological loss of pressure control include visible abdominal protrusion in a dome or keel shape, a sensation of strong distension or pressure on the anterior abdominal wall, and involuntary urine leakage. A strict rule of the method states that if the breathing pattern is disrupted during an exercise or signs of pressure-control loss appear, such as abdominal bulging, the load level must be reduced immediately by modifying the starting position or decreasing the amplitude.

2.3. Breathing Algorithm for Exercises

To ensure the safety of each movement, a strict breathing algorithm has been developed and integrated into all functional exercises of the protocol. The algorithm begins with a preparation phase. A slow, controlled inhalation is performed through the nose. At this stage, the focus is on expanding the lower ribs laterally and posteriorly, while the abdomen remains relatively soft and the shoulder girdle remains fully relaxed.

The second phase coincides with the moment of maximal physical effort in the exercise, which is the overcoming of resistance. An emphasized yet unforced exhalation is performed through the mouth, often with the use of slight lip resistance, for example, with the sounds 'sss' or 'fff'. At this moment, gentle reflexive activation of the deep core muscles and pelvic floor occurs. They draw upward and in- ward, creating a reliable corset. The integrative breathing algorithm of functional movement is shown in Figure 2.

During algorithm execution, maintaining a fully neutral trunk position throughout the entire movement cycle is important. Any compensatory pelvic tucking or aggressive lumbar extension is excluded, since alteration of cylinder geometry disrupts pressure-distribution vectors at once.

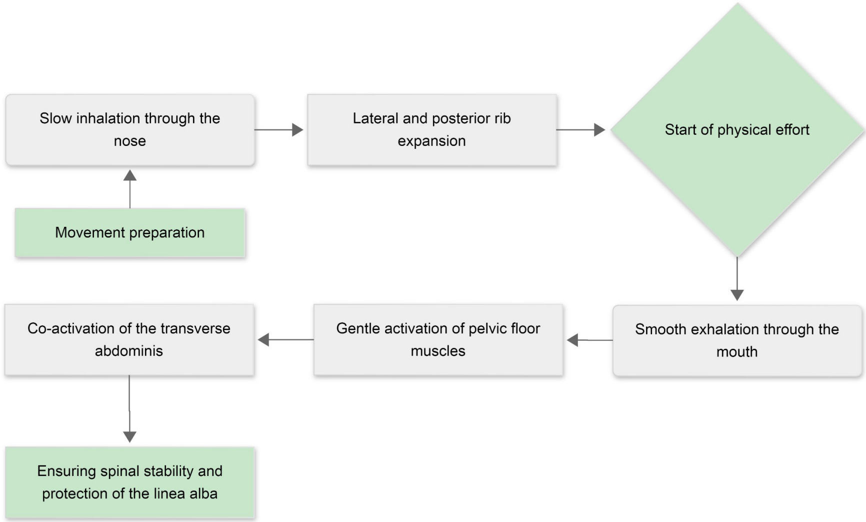

Fig. 2. Integrative breathing algorithm for functional movement

CHAPTER 3. AUTHORIAL CONDITION ASSESSMENT SYSTEM AND PRINCIPLES OF PROGRESSION

3.1. System of Condition Assessment Before Training

The safety of prenatal training is ensured through the introduction of a pre-training screening procedure. The authorial condition assessment system requires evaluating four critical parameters before each session begins. The first parameter is the position of the pelvis and ribs. The coach or the patient herself analyzes postural symmetry visually and by palpation. Excessive anterior pelvic tilt or upwardly opened lower ribs are identified. Loss of neutral alignment indicates the core muscles' inability to distribute load adequately. The second parameter is breathing control. The patient's ability to integrate 360° breathing without compensatory recruitment of the neck scalene muscles and shoulder elevation is assessed.

The third parameter is trunk stability. A series of light provocative tests is performed, for example, weight transfer from one leg to the other, during which the appearance of a doming pattern on the abdomen or loss of balance is monitored. The fourth parameter, and the most important, is the presence of pain. Physiological muscular discomfort must be differentiated from acute pain in the region of the pubic symphysis, sacroiliac joints, or radicular symptomatology.

A simple yet effective decision-making algorithm allows rapid interpretation of assessment results. If all four parameters are within the normal range, the verdict is Train at full volume. If minor deviations are detected, for example, mild fatigue or loss of control in complex positions, the rule Modify the load is applied, which implies reduction of amplitude, use of additional support, or transition to floor-based positions. If acute pain, inability to control intra-abdominal pressure even at rest, or marked deterioration in well-being is identified, the decision is to skip the training session.

Table 3

Decision-making matrix based on pre-training assessment of the state

Assessment Parameter	Ideal State, Normal	Borderline State, Compensation	Critical State, Red Flag	Required Action
Pelvic and Rib Position	Neutral alignment, rib cage stacked over pelvis	Mild hyperlor dosis, tendency toward rib flare	Pronounced pelvic tilt, rigid rib fixation, inability to correct	Modify range of motion; if rigidity persists, remove strength component
Breathing Control	Stable 360° expansion without neck involvement	Shallow breathing requiring constant verbal cues	Apnea, breath holding, under minimal effort, paradoxical breathing	Reduce load; focus exclusively on breathing patterns
Core Stability	Maintains intraabdominal pressure, no bulging, doming	Mild doming at peak effort	Pronounced ridge, diastasis, during any movement, linea alba collapse	Transition to positions with greater support, seated or quadruped, reduce leverage
Pain Presence	No pain	Mild discomfort in muscles or ligaments, resolving with warmup	pubic symphysis, sacrum, or lower back	Immediately stop training; refer to obstetrician-gynecologist

The results of this assessment are directly related to exercise selection and to nutritional correction, which will be discussed in the seventh chapter. The decision-making matrix based on pre-training condition assessment is shown in Table 3.

3.2. Principles of Load Progression Without Overload

The distinction between the functional method of pregnancy support and classical hypertrophy programs lies in the concept of progression. The reference point for increasing complexity is movement quality and the ability to control breathing, not quantitative metrics such as the weight of resistance or the number of repetitions performed. Progression is built through control of stability.

To make an exercise more difficult, it is not necessary to add heavy dumbbells. It is sufficient to reduce the base of support, for example, by moving from a bilateral position to a unilateral one, to increase lever length, or to add an unstable surface in the form of a fitball. The principles of scaling provide clear instructions for simplifying and increasing the complexity of each exercise in the protocol. The principal limiting factor and indicator of overload is the anterior abdominal wall. If the breathing rhythm is disrupted or pressure builds, causing abdominal protrusion as the task becomes more difficult, this indicates that neuromuscular control has been lost, and the load must be reduced immediately to the previous level. Progression is built through increasing demands on proprioception and motor control.

3.3. Typical Errors During Pregnancy

The most destructive error is the use of excessive weight and blind copying of training protocols developed for non-pregnant athletes. Such protocols ignore the physiological relaxation of connective tissue and lead inevitably to biomechanical failure. The second error is neglecting the breathing algorithm. The performance of presses or pulls during breath holding generates immense internal pressure that injures the structures of the pelvic floor.

The third erroneous pattern is working to the point of exhaustion. The pursuit of repetition number, bringing muscles to failure, and ignoring fatigue signals leads to depletion of the neuroendocrine reserves required for fetal development. Errors of adjacent domains are also identified. These include the use of heavy cosmetic and nutritional oils that create excessive metabolic load on the liver. These errors also include the use of traumatic care techniques, for example, aggressive brushing after rigid fixation, which provokes tension of the fasciae of the head and neck, as well as uncontrolled overstretching of joints whose amplitude is falsely increased by the action of the hormone relaxin.

These errors can be avoided with the aid of the matrix in Table 3, which establishes the order of checks before each session and provides the appropriate action immediately upon detection of a deviation. The coach first evaluates pelvic and rib position, then breathing, then trunk stability, and pain presence. After this, the work format is selected: full volume, modification, or cancellation of training. For example, a pregnant woman plans to perform squats with a dumbbell. On examination, a slight opening of the lower ribs is visible, breathing remains shallow, and a small bulge along the linea alba appears at the top point of the movement. According to the matrix, this condition falls within the borderline range. In this case, the weight is removed, the amplitude is reduced, the exercise is converted to a supported version at a wall or chair, and 360° breathing control is restored.

CHAPTER 4.
TRAINING PROTOCOL:
FIRST TRIMESTER

4.1. Tasks and Features of the First Trimester

The first trimester is a period of endocrine adaptation, marked by placental development and fetal organogenesis. The physiological profile of this stage often includes early toxicosis, marked nausea, reduced appetite, and persistent exhausting fatigue (Kaňková et al., 2023). In view of these factors, the tasks of the training protocol differ radically from standard fitness goals. The absolute priority becomes learning breathing-control patterns and gentle activation of the deep layers of the myofascial system. Training sessions are energy-con-serving and are directed toward reducing fatigue, maintaining basal tone, and adapting the nervous system to the anticipated increase in body mass during the second and third trimesters.

4.2. Protocol of 7 Basic Exercises for the First Trimester

The first-trimester protocol consists of seven basic motor acts, each performing a specific task of mobilization, activation, or stabilization and is strictly subordinated to the breathing algorithm.

The first exercise, called 360° breathing in the seated position, is aimed at developing effective breathing control and training in man- aging intra-abdominal pressure. Its use improves rib cage mobility, reduces tension in the shoulder girdle, and prepares for strength training. The diaphragm, the transverse abdominal muscle, and the intercostal muscles are involved in the work. The starting position is seated, with full foot contact with the floor, neutral pelvic position, rib placement over the pelvis, and elongation through the crown of the head. The hands are placed on the lower ribs for sensory monitoring of respiratory movement. The execution technique is based on calm nasal inhalation, directing the air into the lateral and posterior regions of the rib cage. The shoulders remain down’ and the spine is erect. The abdomen is not pushed out when breathing in. In a neutral trunk position’ the deep core muscles contract gently while breathing out through the mouth. The shoulders are relaxed’ and the exhale does not entail excessive tension. The sets consist of 6–8 breathing cycles’ to be repeated for 2 sets’ with 30–40 seconds of rest in between. Common mistakes include lifting the shoulders on inhalation’ lumbar

hyperextension’ forcing exhalation’ and tensing the neck muscles. Later’ modifications’ such as being supine and with knees bent’ are made to relieve the gravitational load on the spine’ and then awareness of coordinated pelvic floor muscle involvement is added. These muscles must draw upward smoothly during exhalation.

The second exercise of the protocol is thoracic mobilization in the seated position, aimed at increasing mobility of the thoracic spine and costal arches, which reduces compensatory load on the lumbar region. In this movement, the muscles of the thoracic spine and the intercostal muscles perform the active work. The starting position corresponds to the first exercise and includes a seated posture with the feet supported on the floor, neutral pelvic position, rib placement over the pelvis, and elongation through the crown of the head. The arms are crossed over the chest or held in front of the body. The execution technique begins with nasal inhalation in the central position. During exhalation, thoracic rotation to one side is performed while the pelvis remains immobile. The movement is executed without participation of the lumbar region. This is followed by a return to the starting position

and repetition on the opposite side. The exercise is performed for 6–8 repetitions to each side in 2 sets with 30–40 seconds of rest between sets. Typical errors include rotation through the lumbar region, backward trunk deviation, breath holding, and excessive tension in the shoulders. For simplicity, the rotation amplitude is minimized to the full comfort zone. Progression is achieved by holding a light resistance band or expander in front of the chest, which creates isometric resistance.

The third excercise is the glute bridge. It seeks to activate the gluteus maximus' correct the position of the sedentary pelvis' prevent hyper-extension of the lumbar' improve the functional mobility of the hip joint' correct breathing' and prepare the body for erect exercises. The main muscles used are the gluteus maximus and the back of the thigh. Stabilizing muscles include the transverse abdominal muscle' pelvic floor muscles' and spinal multifidus muscles. The starting position is supine with the feet at pelvic width, knees bent, and arms positioned along the trunk. The pelvis maintains a neutral position. The ribs are placed over the pelvis. The neck remains in a neutral position. The execution technique begins with inhalation through the nose. During exhalation, gentle activation of the deep trunk muscles occurs, after which the pelvis is lifted to the pelvis–rib cage line. Support is maintained on the feet and the inferior angles of the scapulae. Rib position remains under continuous control. The movement is initiated by the gluteal muscles. The lumbar region maintains stability without hyperextension. The knees remain parallel. The load is not transferred to the cervical region. Breathing remains free throughout the entire set. Return to the starting position is performed smoothly. The exercise is performed at a volume of 10–12 repetitions in 2–3 sets, with 40–60 seconds of rest. Typical errors include lifting the pelvis through the lumbar region, rib flare, inward knee collapse, and excessive neck tension. Simplification is achieved by reducing the height of the pelvic lift. Progression is possible by holding the top position for several counts or by using an elastic band placed just above the knee joints to further activate the abductor muscles.

The fourth exercise is the heel slide, aimed at activating the deep trunk muscles while maintaining a neutral position of the pelvis and rib cage, stabilizing the pelvis during dynamic movement of the lower extremities, and preparing for functional movement patterns. The transverse abdominal muscle, diaphragm, and pelvic floor muscles participate actively in the exercise. The starting position is supine. The pelvis maintains a neutral position. The ribs are placed over the pelvis. One leg is bent with the foot supported. The second leg is also bent and prepared for sliding. The hands are placed on the lower ribs or along the trunk. The execution technique begins with nasal inhalation into the lateral regions of the rib cage. During exhalation, gentle activation of the deep trunk muscles is performed, after which the heel slides slowly forward along the floor to partial or full extension of the leg. Stable pelvic and rib position is maintained throughout the entire amplitude. The leg then returns to the starting position, after which the movement is performed to the other side. The exercise is performed for 8–10 repetitions on each side in 2 sets, with 30–40 seconds of rest between sets. Typical errors include lumbar arching, forward abdominal protrusion, and loss of control over rib position. For simplification, the sliding amplitude is reduced by

half. For progression, sliding can be performed without heel contact with the floor. The leg slides through the air, one millimeter above the surface, placing greater demands on core stabilization.

The fifth exercise is the supported squat, aimed at practicing correct squatting technique with trunk control, developing functional strength of the lower extremities, training pelvic stabilization in the upright position, and preparing for daily motor tasks, including rising from a chair and other basic transfers. The main work is performed by the gluteal muscles and quadriceps. The deep trunk muscles, pelvic floor muscles, and spinal extensors participate in stabilization. The starting position is a stance with the feet at pelvic width or slightly wider, with hand support on straps, another stable support in front, or a sturdy chair. The trunk maintains a neutral position. The ribs are placed over the pelvis. The gaze is directed forward. The execution technique begins with nasal inhalation in the starting position or during the lowering phase. During exhalation, gentle activation of the deep trunk muscles occurs, after which flexion is performed at the hip and knee joints with the pelvis directed backward and downward. Neutral spinal position is maintained throughout the full amplitude. The return to the starting position is performed through support on the feet and controlled extension of the lower extremities. The exercise is performed in a volume of 10–12 repetitions in

2–3 sets with 60 seconds of rest. Typical errors include rounding of the lumbar region, shoulder elevation, weight transfer onto the toes, heel lift, and loss of neutral spinal position. Simplification uses squatting onto a high support, box, or fitball. Progression is achieved by minimal hand support or a pause at the lowest point of the amplitude.

The sixth exercise is a resistance-band row to the waist, aimed at developing back-muscle strength, building postural endurance, stabilizing the thoracic region, improving control of scapular position, and reducing load on the cervical region. The main work is performed by the latissimus dorsi, rhomboid muscles, and the middle part of the trapezius muscle. The deep trunk muscles and spinal extensors participate in stabilization. The starting position is a stance with the feet at pelvic width, knees slightly bent, neutral trunk position, and ribs placed over the pelvis. The band is fixed in front of the body. The arms are extended forward. The execution technique begins with inhalation in the starting position. During exhalation, the deep trunk muscles are gently activated, and the band is then pulled toward the waist. The elbows move backward along the trunk. The scapulae move toward the spine and downward. Return to the starting position is performed smoothly and under control. The exercise is performed at a volume of 10–12 repetitions in 2–3 sets, with 40–60 seconds of rest between sets. Typical errors include lumbar hyperextension, execution of the row mainly through the arms without participation of the back muscles, shoulder elevation, and forward rib displacement. Simplification consists of performing the row seated on a chair or a fitball. Progression consists of using a denser band or performing the row one arm at a time, which requires additional trunk stabilization against rotation.

The complex is completed by *the seventh exercise*, aimed at restoring breathing after load, reducing muscular tension, improving

mobility of the thoracic spine and shoulder girdle, gentle mobilization of the thoracic region, normalization of rib cage and pelvic position, and restoration of control of the deep core muscles through breathing rhythm. The diaphragm, intercostal muscles, transverse abdominal muscle, pelvic floor muscles, deep spinal extensors, and serratus anterior participate in the work. The starting position is seated on a mat or chair, with the spine elongated, neutral pelvic position, stable foot support, and free arms. The hands may be placed on the ribs or perform an accompanying movement. The execution technique is based on calm nasal inhalation, directing the air into the lateral and posterior regions of the rib cage. At the same time, a gentle mobilizing arm movement is performed, accompanied by chest opening or arm elevation. During exhalation through the mouth, the ribs descend gently, while the deep abdominal and pelvic floor muscles are recruited through natural breathing coordination. The entire movement is performed slowly with maintenance of control over lumbar position. The exercise is carried out in 2–3 sets of 6–8 breathing cycles at a slow pace. Typical errors include breathing only into the anterior surface of

the rib cage, excessive lumbar arching, and shoulder elevation. Simplification consists of performance with- out arm movements, with focus only on breathing. Progression is not applied in this restorative pattern.

4.3. Step-by-Step SOP with Timing

The standard operating procedure for first-trimester training is based on a fixed schedule, since in this period careful expenditure of energy resources and preservation of stable well-being throughout the session are required. The session begins with a 7–10-minute warm-up. This block includes a 360° breathing setup and joint mobilization, presented in exercises 1 and 2. The warm-up prepares the rib cage, pelvis, and deep muscular layers for subsequent work, reduces muscular tension, and helps establish control over rib and pelvic position from the first minutes of the session.

The main part lasts 20–25 minutes and includes exercises 3–6 aimed at activation of the gluteal muscles, trunk stabilization, acquisition of basic movement patterns, and development of postural endurance. Each exercise is performed in 2–3 sets of 8–12 repetitions or breathing cycles. The remaining 40–60 seconds are spent between sets to preserve movement quality and breathing control. The training session concludes with a 5-minute cool-down that includes exercise 7 for breathing restoration and the reduction of residual tension. This structure allows maintaining the session's working density without excessive fatigue or loss of motor control.

4.4. Nutritional Combination of the First Trimester

Nutritional support in the first trimester must be tailored to the client's physical condition, given the high risk of nausea and reduced appetite. The primary task is stabilization of blood glucose levels, which prevents acute episodes of hypoglycemic weakness, and provision of the body with a sufficient pool of easily digestible protein to support muscle mass and fetal tissue formation (Zhao et al., 2023). The functional integration matrix for the first trimester is provided in Table 4.

Table 4

Functional integration matrix for the first trimester

Intervention Vector	Key Objectives of the Period	Applied Methodological Tools
Biomechanics and Fitness	Breathing training, gentle core activation, fatigue prevention	360° breathing, glute bridge, basic squats with mandatory support
Neuromotor Control	Stabilization of pelvis and lumbar region during early changes	Isolated heel slides, rib control in static positions
Nutritional Strategy	Nausea management, blood sugar stabilization, support of DNA synthesis	Fractional meals, folates, leafy greens, iron, meat, vitamin C, strict hydration

Specific focus is placed on micronutrients important for early embryo-genesis (Rísová et al., 2024). Folates, which are the natural form of folic acid and are necessary for the prevention of neural tube defects, are derived from green leafy vegetables such as spinach, broccoli, and asparagus. The need for iron increases against the background of expanded circulating blood volume. Its optimal sources are red meat, organ meats, and legumes. B vitamins obtained from whole-grain products support the function of the maternal nervous system, while vitamin C from fresh vegetables and fruits improves the absorption of non-heme iron synergistically. A critical aspect is maintenance of hydration, which ensures adequate plasma volume and prevents dehydration during toxicosis.

CHAPTER 5.
TRAINING PROTOCOL: SECOND TRIMESTER

5.1. Tasks and Features of the Second Trimester

The second trimester is often subjectively perceived by patients as the most comfortable period, the golden middle. From a biomechanical standpoint, however, it presents substantial challenges. Continued fetal growth and the increase in amniotic fluid volume provoke an avalanche-like forward shift of the body's center of gravity. To preserve upright posture, the body compensates for this shift by deepening lumbar lordosis and progressively increasing thoracic kyphosis, that is, slouching (Popajewski et al., 2024). The task of this period is to maintain pelvic stability, which depends on the strength of the gluteus medius and gluteus maximus. Strengthening these structures in the frontal and sagittal planes prevents dysfunction of the sacroiliac joints. An additional priority is the adaptation of the body to increasingly complex daily patterns, including bending safely, lifting objects from the floor, and ascending and descending stairs.

5.2. Logic of Progression from the First to the Second Trimester

The methodological transition from the first to the second trimester involves a change in spatial orientation. This has important ramifications: supine and seated postures need to be replaced with more vertical activities such as standing and stepping' as the inferior vena cava is compressed in the horizontal position' and postural reflexes need to be trained in the presence of real gravitational loading (Kember et al.' 2024). Progression consists of increasing the demands placed on proprioceptive stabilization of the joints while maintaining the 360° breathing algorithm in strict form. Exercises become asymmetrical, for example, lunges or lateral steps, which imitate the locomotor tasks of daily life.

5.3. Protocol of 7 Basic Exercises for the Second Trimester

The first exercise is breathing with deep-muscle activation while standing against a wall. It aims to integrate breathing skills and trunk control in the vertical position, preserve neutral rib and pelvic positions in stance, teach breathing without lumbar hyperextension, activate the deep core muscles, and reduce load on the lumbar region through external feedback. The primary work is performed by the diaphragm and the transverse abdominal muscle. The gluteal and pelvic floor muscles contribute to stabilization. The starting position is a stance against a wall in which the occiput, thoracic region, and sacrum maintain light contact with the surface. The feet are placed 10–15 centimeters from the wall. The knees remain slightly flexed. The hands are placed on the lower ribs to monitor respiratory expansion. The execution technique is based on nasal inhalation with rib expansion to the sides and posteriorly. During exhalation, gentle activation of the pelvic floor and transverse abdominal muscle is performed. Throughout the entire breathing cycle, contact with the wall is preserved without lumbar hyperextension, and a neutral pelvic position is maintained. The exercise is performed in 2–3 sets of 6–8 breathing cycles. Typical errors include forward abdominal protrusion, loss of contact of the sacrum or other support points with the wall, and shoulder tension. Simplification: performance of the exercise while seated on a fitball. Progression: addition of isometric pressure with straight arms against the wall during the exhalation phase.

The second exercise is the supported static lunge. It is aimed at developing the strength of the gluteal muscles and lower-extremity muscles, forming pelvic stability, teaching pelvic control in the frontal plane, improving balance, preventing lumbar overload, and preparing for stepping movements and stair ascent. The main work is performed by the gluteus maximus and quadriceps femoris. The gluteus medius, hip adductors, deep core muscles, and the muscles of the foot and ankle participate in stabilization. The starting position is a wide-step stance, with one leg in front and the other behind on the forefoot, while the hands are held on a support such as a wall, straps, or a chair. The pelvis is directed forward. The spine is elongated. Body weight is predominantly transferred to the front leg. The execution technique begins with an inhalation in the top position, while maintaining a neutral pelvic position. During exhalation, the knees are flexed through a small amplitude, and the trunk descends vertically. Upward ascent is performed by pressing the heel of the front leg into the floor, activating the gluteal muscles. The exercise is performed in 2–3 sets of 10–12 repetitions on each leg. Typical errors include transferring weight onto the rear leg, pelvic drop to one side, lumbar hyperextension, inward displacement of the front knee, and loss of balance. Simplification: marked reduction of knee-flexion amplitude. Progression: performance of dynamic backward steps into a lunge with reliable one-hand support.

The third exercise is the standing resistance-band row to the trunk. It is aimed at strengthening the upper back muscles, building postural endurance, compensating for increasing thoracic kyphosis, preventing slouching, activating the interscapular musculature, improving control of rib cage position, reducing load on the cervicobrachial region, and integrating the work of the arms and trunk.

The main work is performed by the rhomboid muscles, the middle and lower portions of the trapezius muscle, as well as the latissimus dorsi. The posterior bundles of the deltoid muscles, the deep core muscles, and the gluteal muscles contribute to stabilization and maintain a stable pelvic position. The starting position is a stance with the feet at pelvic width, the knees slightly flexed, and the pelvis and ribs in neutral position. The band is anchored at chest level. The arms are in front’ palms facing each other. As a first stage’ the figure inhales while lengthening the torso along the longitudinal axis’ moving the band towards the torso as a result. The scapulae are positioned posteriorly and inferiorly’ while the elbows are positioned laterally to the body. Return to the starting position in a controlled manner. The exercise should be performed in 2 to 3 sets of 12 to 15 repetitions. Common errors of execution include pulling through the arms rather than the back’ forward head posture or lumbar hyper-extension’ shoulder elevation toward the ears’ and jerky movements. Simplification: performance of the row with ultra-light resistance in the seated position. Progression: performance of the row in a light squat position for additional static loading of the legs.

The fourth exercise is lateral stepping with an elastic band. It is aimed at strengthening the gluteus medius, forming pelvic stability in the frontal plane during functional displacements, preventing pelvic drop during gait, preparing for increased body mass and center-of-gravity shift, and reducing load on the lumbar region. The main work is performed by the gluteus medius and gluteus maximus. The deep core muscles and the hip adductors contribute to stabilization. The starting position is a stance with the feet at pelvic width, neutral pelvic position, slightly flexed knees, and a vertical trunk position. The hands are placed on the pelvis or in front of the body. The elastic band is positioned above the knees. As a progression, it may be placed at the shank level. The execution technique involves taking a small step to the side while maintaining constant tension on the band. The knees are directed along the line of the feet. The pelvis maintains a stable position. The second leg is brought in without loss of band tension. Breathing remains free and unheld, with emphasis on exhalation during the step. The exercise is performed in 2–3 sets of 10–12 steps to each side. Typical errors include lateral trunk collapse,

inward knee collapse, loss of band tension, swaying, and excessive lumbar tension. Simplification: performance of the steps without an elastic band while maintaining biomechanical control. Progression: displacement of the elastic resistance band to the level of the ankles.

The fifth exercise is the hip hinge with support. It is aimed at forming the correct movement pattern of bending through the hip joints, unloading the lumbar region, strengthening the posterior chain, activating the gluteal muscles, reducing hypertonicity of the lumbar extensors, preparing for daily movements, including bending and lifting objects, and forming a neutral trunk position. The main work is performed by the gluteus maximus and the posterior thigh muscles. The deep core muscles and gluteus medius participate in stabilization. The starting position is a stance facing a support, such as a chair, wall, or straps. The feet are placed at pelvic width. The knees remain slightly flexed. The spine preserves an elongated position. The palms are placed on the support. The pelvis is maintained in a neutral position. The execution technique begins with an inhalation followed by axial elongation of the trunk. The pelvis is then directed backward, and the trunk inclines forward without flexion in the lumbar region. Body weight is distributed evenly between the middle of the foot and the heels. During exhalation, the return to the starting position is performed by activating the gluteal muscles. The exercise is carried out in 2–3 sets of 10–12 repetitions. Typical errors include rounding of the back, excessive knee flexion, performing the movement through the lumbar region, forward displacement of the trunk without pelvic movement backward, and transfer of weight onto the forefoot. Simplification: performance of the exercise with a light ball held between the thigh and abdomen to monitor flexion. Progression: use of an elastic band stretched around the thighs, which creates resistance during extension.

The sixth exercise is circular pelvic movements on a fitball. It is aimed at gentle mobilization of the hip joints and the lumbopelvic region, reduction of muscular tension, improvement of blood circulation in the pelvic area, improvement of pelvic mobility

within a safe amplitude, unloading of the lumbar region, teaching relaxation of the pelvic floor muscles, and preparation for childbirth through the development of pelvic mobility. In low-intensity dynamic work, the gluteal muscles, hip adductors, and lumbar muscles are involved. The deep core and pelvic floor muscles are included in stabilization during coordination and relaxation. The starting position is seated on a fitball with the feet placed wide apart and fully supported on the floor, the shanks vertical, the pelvis in neutral position, the spine elongated upward, and the shoulders relaxed. The hands are placed on the thighs or rest freely on the ball. The execution technique is constructed as a continuous, slow, and controlled displacement of the pelvis along a circular trajectory. The pelvis first shifts gently forward, then moves to one side, after that moves backward without lumbar hyperextension, and then shifts to the opposite side with closure of the circle. Breathing remains free, deep, and without holding throughout the entire movement. After performance in one direction, the direction is changed. Typical errors include initiating the movement through the thoracic region instead of the pelvis, excessive lumbar arching, tension in the shoulder girdle, lifting the feet from the floor, excessively large and uncontrolled amplitude, and breath holding. Simplification: linear rocking of the pelvis forward and backward or right and left. Progression: integration of the visualization of a flower opening, that is, relaxation of the perineum at the moment of pelvic roll backward.

Recovery breathing in the side-lying position is *the seventh exercise*. It is aimed at reducing heart rate, normalizing breathing rhythm, relaxing the pelvic floor muscles, decreasing residual tension in the lumbothoracic spine, improving venous outflow, unloading the lumbar region, and providing gentle integration of the diaphragm, abdominal muscles, and pelvic floor muscles. The primary respiratory function is performed by the diaphragm. The transverse abdominal muscle and pelvic floor muscles are included as synergists. The starting position is side-lying with the lower leg flexed, a pillow or roller placed between the knees, support under the head, a neutral spinal position, and a pelvic position perpendicular to the surface. The upper hand is placed on the lower ribs for tactile monitoring of breathing. The lower hand is positioned under the head or in front of the trunk. The execution technique is structured around a controlled breathing cycle, with emphasis on expanding the posterolateral regions of the rib cage and preserving general muscular rest. Inhalation is performed slowly through the nose. Air is directed into the posterolateral regions of the rib cage. During inhalation, a sensation of rib expansion into the palm appears. In this phase, conscious relaxation of the pelvic floor muscles is preserved. Exhalation is performed through the mouth at a prolonged, calm pace. During exhalation, a gentle, reflexive activation of the deep abdominal muscles occurs, linked to the natural coordination of breathing and trunk stabilization. Throughout the entire exercise, full relaxation of the shoulder girdle, the anterior abdominal wall, and the facial muscles is maintained. Typical errors include upper-chest

breathing, drawing in the abdomen during inhalation, shoulder-girdle tension, neck-muscle tension, and breath holding. Simplification: addition of support beneath the enlarging abdomen. Progression is not required.

5.4. Nutritional Combination of the Second Trimester

In the second trimester, the maximal rate of increase in placental size and amniotic fluid volume is observed, which underscores the need to adjust the nutritional profile (Jouanne et al., 2021). Basal metabolic rate rises and requires adequate energy and plastic supply. Protein remains the primary macronutrient and serves as the foundation for maternal muscular adaptation and fetal structural growth. Among micronutrients, calcium comes to the foreground, since the need for it is determined by intensive mineralization of the child's skeleton. Optimal dietary sources are fermented dairy products, sesame seeds, and dark-green vegetables. Magnesium functions in close biochemical synergy with calcium. Supplied from nuts, seeds, and unrefined grains, magnesium performs the function of a natural myorelaxant by blocking excessive calcium entry into muscle cells, which prevents calf cramps and myometrial hypertonicity. Omega-3 polyunsaturated fatty acids obtained from cold-water fish and flax seeds are incorporated into the phospholipid bilayers of cell membranes, ensure fetal neurogenesis, and reduce the systemic inflammatory response of the maternal organism.

CHAPTER 6. TRAINING PROTOCOL: THIRD TRIMESTER

6.1. Tasks and Features of the Third Trimester

The third trimester is the final stage of adaptation’ including the period of peak biomechanical overload as a result of an increased uterine volume’ drastic center of mass shift’ severe hyperlordosis and compression of the lumbar aspect joints. Maximum pressure on the diaphragm constricts the normal movements during inspiration and can cause dyspnea’ even at low pressures (Popajewski et al.’ 2024).

In this regard, the task vector of the training protocol changes. Strength indicators recede into the background. The priority becomes the provision of movement safety, joint decompression, support of rapidly deteriorating balance, and directed preparation of the osteomuscular pelvic structures for labor. Special attention is given to preserving hip-joint mobility and to training in conscious relaxation of the pelvic floor muscles, which are predictors of successful progression through the first and second stages of labor.

6.2. Logic of Adaptation from the Second to the Third Trimester

The methodological transformation from the second to the third trimester is subordinated to the principle of a protective regime. The logic of adaptation consists of deliberate reduction of the amplitude of all movements in order to prevent overstretching of the ligaments, since the effect of relaxin reaches its maximum. The role of external static supports such as walls, fitballs, or chairs increases sharply, offsetting the risk of balance loss and falling. Priority is given to breathing control, spinal articulation, and relaxation practices, while hypertrophic or strength stimuli are excluded from the protocol. The biomechanical logic of protocol transformation in the third trimester is shown in Figure 3.

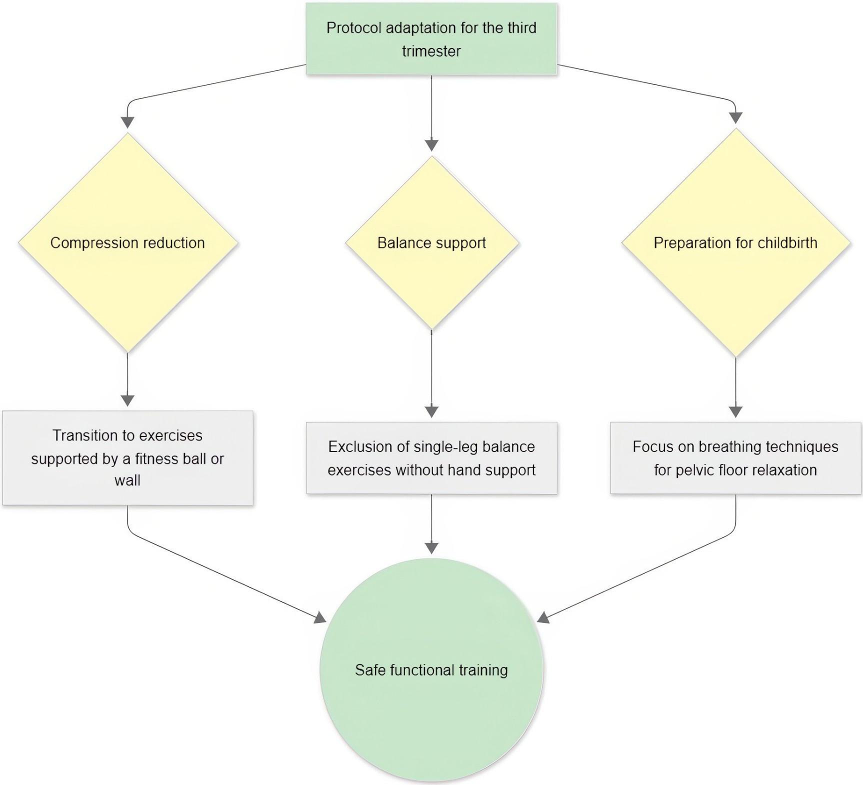

Fig. 3. Biomechanical logic of protocol transformation in the third trimester

6.3. Protocol of 7 Basic Exercises for the Third Trimester

The first exercise is lateral breathing with rib expansion in the side-lying position. It is aimed at improving rib-cage mobility, facilitating breathing in the third trimester, reducing tension in the thoracic spine, improving pulmonary ventilation, providing gentle activation of the diaphragm and deep trunk muscles, and supporting respiratory function under conditions of increased abdominal volume and pronounced uterine pressure on the diaphragm. The main work is performed by the diaphragm and the external and internal intercostal muscles. The transverse abdominal muscle, the multifidus muscles of the spine, the pelvic floor muscles, and the oblique abdominal muscles participate in static stabilization. The starting position is side-lying on a mat, preferably on the left side, with a pillow between the flexed knees to unload the pelvis and lumbar region. The lower arm is flexed and supports the head. The upper hand is placed on the lower ribs or on the abdomen for tactile monitoring of breathing. The pelvis maintains a neutral position. The spine preserves its natural curves. The shoulders remain relaxed. The execution technique is based on slow nasal inhalation, directing the breath into the lower ribs, the lateral regions of the rib cage, and the back. During inhalation, the ribs expand gently to the sides and backward, creating a sensation of pressure in the palm. Exhalation is performed through the mouth at a slow and calm pace, including through slightly closed lips, after which the ribs gradually return to the starting position. Breathing maintains an even rhythm without holding or excessive tension. The exercise is performed for 6–8 breathing cycles, after which a side change is possible. Typical errors include shoulder elevation during inhalation, shallow breathing through the upper rib cage, excessive abdominal tension, forced drawing in of the abdomen, lumbar arching, breath holding, and an excessively rapid breathing rhythm. Simplification: performance of the pattern in a semi-seated position in an armchair. Progression: creation of light manual resistance, pressure of the palm on the ribs, in the inhalation phase, for stimulation of the intercostal muscles.

The second exercise is a standing calf raise with support. Its task consists in activation of the musculovenous pump of the lower leg, improvement of venous return from the lower extremities, support of venous outflow, reduction of the risk of leg edema, and preservation of balance under conditions of an altered center of gravity. The main work is performed by the gastrocnemius and soleus muscles. The gluteal muscles, the transverse abdominal muscle, and the multifidus muscles of the spine participate in the stabilization of body position. The starting position is a stance facing a wall or the backrest of a sturdy chair, with both hands securely supporting it. The feet are placed at pelvic width. Body weight is distributed evenly across both legs. The spine maintains a neutral position. The trunk is held vertically. During exhalation, a slow, controlled rise onto the toes is performed, with the heels lifting from the floor. The movement is directed strictly upward and is carried out without jerking. During inhalation, the heels are lowered smoothly onto the floor. The exercise is performed at a calm pace for 10–12 repetitions. Typical errors include forward displacement of the pelvis and rib cage onto the support, collapse, transfer of body weight onto the forefoot, an excessively rapid tempo, forward trunk inclination, tension in the shoulder girdle, incomplete rise onto the toes, and sharp springing movements. Simplification: performance of alternating heel raises in the seated position. Progression: at the top point of the rise, a hold for 1–2 seconds. Lowering is carried out as slowly as possible, with eccentric control.

Standing elastic-band row to the trunk is *the third exercise*. Its purpose consists of activation of the back muscles, improvement of posture in the third trimester, reduction of tension in the thoracic region and shoulder girdle, and support of spinal stability under conditions of gravitational forward displacement of the shoulders under the weight of the mammary glands and the abdomen. The primary work is performed by the rhomboid muscles, the middle portion of the trapezius muscle, and the latissimus dorsi. The transverse abdominal muscle, pelvic floor muscles, and spinal extensors participate in static stabilization. The starting position is a stance on both feet placed at pelvic width, with the knees slightly flexed. The elastic band is anchored in front of the body at chest level, and the arms are extended forward. The back preserves a neutral position. The shoulders remain relaxed. Before movement begins, inhalation is performed. During exhalation, the band is drawn smoothly toward the trunk, the elbows are directed backward along the body, the scapulae are approximated gently, the rib cage opens, and the pelvis preserves a neutral position. In the third trimester, the abdomen must remain relaxed throughout the full range of motion. During inhalation, the arms return slowly to the starting position. The exercise is performed at a calm pace

for 8–10 repetitions. Typical errors include arching in the lumbar region during pulling, elevation of the shoulders toward the ears, jerky movements, lateral flaring of the elbows, and breath holding. Simplification: performance of the row with minimal resistance while seated on a fitball. Progression: integration of a light head turn to the side in the phase of scapular approximation for mobilization of the cervical region.

The fourth exercise is standing knee abduction with an elastic band. Its purpose consists of the activation of the gluteal muscles, support of the tone of the hip abductors, above all the gluteus medius, improvement of pelvic stability, support of balance in the third trimester, and reduction of lumbar load without creation of compressive axial load on the spine. The main work is performed by the gluteus medius and gluteus minimus. The gluteus maximus, transverse abdominal muscle, and pelvic floor muscles participate in stabilization. The starting position is a stance with the feet at pelvic width. The elastic band is placed above the knees. The knees remain slightly flexed. The back preserves a neutral position. The hands may be kept on the waist or placed on the chair backrest for additional support. During exhalation, gentle movement of the knees outward is performed against band resistance. The movement is executed through the hip joints. The pelvis maintains a stable position. The trunk is held vertically. The feet remain firmly pressed into the floor throughout the full range of motion. During inhalation, the knees return slowly to the starting position. The exercise is performed in a volume of 10–12 repetitions. Typical errors include inward collapse of the knees on the return, forward trunk inclination, an excessively deep squat, jerking movements, trunk swaying, and tension in the shoulder girdle. Simplification consists of performing the clamshell exercise while seated on a chair. Progression is achieved through a micro-pause at the point of maximal band tension.

The fifth exercise is standing pelvic tilts against a wall. Their task includes improving pelvic mobility, delicate mobilization of the lumbosacral junction, reducing tension in the lumbar region, activating the deep core muscles, improving blood circulation

in the small pelvis, and preparing the pelvis for childbirth. The main work is performed by the rectus abdominis and transverse abdominal muscles. The gluteal muscles, pelvic floor muscles, and spinal extensors participate in static stabilization. The starting position is a stance with the back to the wall. The feet are placed at pelvic width. The heels are 10–15 centimeters from the wall. The back is in contact with the wall. The knees remain slightly flexed. The hands may be placed on the pelvis or on the abdomen. The sacrum and thoracic region preserve contact with the wall. During exhalation, gentle anterior pelvic tucking is performed, in which the lumbar region approaches the wall slightly, and the abdominal muscles engage without excessive tension. During inhalation, the pelvis returns to the neutral position. The movement is performed slowly and under control. The amplitude remains small and manageable. The exercise is performed in a volume of 10–12 repetitions. Typical errors include attempting to force the lumbar region into the wall, strong lumbar arching, movement through the shoulder girdle, excessively large amplitude, throwing the head backward, breath holding, and tension in the shoulder girdle. Simplification consists of forward and backward pelvic rocking while seated on a large gymnastic ball. Progression is achieved by adding conscious elongation of the spine with upward extension through the crown of the head at the moment of posterior pelvic tilt.

The sixth exercise is standing leg extension backward with support. Its purpose includes activation of the gluteus maximus, maintenance of its trophic state, improvement of pelvic stability, support of balance under conditions of an altered center of gravity, and reduction of load on the lumbar spine. The primary work is performed by the gluteus maximus. The gluteus medius, posterior thigh muscles, transverse abdominal muscle, and pelvic floor muscles participate in static stabilization. The starting position is a stance beside a chair or wall. One hand is used for support. The feet are placed at pelvic width. The spine preserves a neutral position. The shoulders remain relaxed. During exhalation, the straight leg is slowly extended backward. The movement occurs through the hip joint. The pelvis maintains a stable position.

The trunk is held vertically. The lumbar region must not become involved in the movement through excessive arching. During inhalation, the leg returns smoothly to the starting position. The exercise is performed for 8–10 repetitions on each side. Typical errors include forward trunk inclination, pelvic rotation toward the moving leg, excessive movement amplitude, jerky movements, shoulder girdle tension, and lumbar hyperextension rather than target activation of the gluteal muscles. Simplification consists of performing the movement by sliding the toe along the floor without lifting the foot. Progression is not provided in this exercise because of the risk of destabilization of the sacroiliac joint in the late stages of pregnancy.

The seventh exercise is spinal mobilization in the quadruped position. Its task includes removing gravitational compression from the spinal column, gently articulating the spinal segments, reducing lumbar tension, improving thoracic mobility, and synchronizing breathing with movement. The main work is performed by the spinal extensors and abdominal muscles. The shoulder girdle muscles and the deep trunk muscles contribute to static stabilization. The starting position is the hands-and-knees posture, in which the palms are placed under the shoulder joints, the knees under the hip joints, the back is held in a neutral position, and the head continues the line of the spine. During inhalation, the abdomen descends gently under the action of gravity, the rib cage opens, and the gaze may be directed slightly for- ward. At the same time, control of movement amplitude is preserved so as not to create excessive lumbar arching. During exhalation, the back is smoothly rounded, the coccyx is directed downward, and the head lowers gently. The transition between phases remains sequential and continuous. The exercise is performed in a volume of 6–8 repetitions. Typical errors include excessively deep lumbar arching, transfer of body weight onto the hands, abrupt movements, and breath holding. In the presence of wrist joint discomfort or heart-burn, the exercise is performed in a standing position with forearm support on a high table or windowsill. Progression is not applied to this movement.

6.4. Nutritional Combination of the Third Trimester

The nutritional strategy in the third trimester aims to address three tasks: controlling the rate of body-mass gain, optimizing digestive processes, and preparing the blood-clotting system and tissues for delivery.

Physiological pressure of the enlarged uterus on the intestinal loops slows peristalsis. An overfilled intestine causes discomfort and exerts additional mechanical pressure on the anterior abdominal wall and the pelvic diaphragm, thereby aggravating the risk of diastasis and hemorrhoids (Daher et al., 2021). To offset this factor, the diet must be enriched with soluble and insoluble fiber, such as vegetables, psyllium, and whole grains, in combination with an adequate drinking regimen. Water, in this context, functions as a solvent and as a factor in maintaining the elasticity and hydration of fascial tissues, which directly affects the capacity of the birth canal for safe stretching (Slater et al., 2024).

Iron remains a micronutrient because the maternal organism forms erythrocyte reserves to compensate for the inevitable blood loss during labor. A sufficient ferritin level correlates with high energy levels and the capacity to tolerate labor contractions. Omega-3 fatty acids support the terminal stages of fetal nerve-fiber myelination and reduce the risk of premature rupture of membranes. Maintenance of a stable glycemic level, that is, rejection of simple sugars in favor of complex carbohydrates, makes it possible to avoid excessive neonatal weight and reduces the mother's subjective sensation of chronic fatigue.

CHAPTER 7. NUTRITIONAL SUPPORT AS AN INTEGRAL PART OF THE PROTOCOL

7.1. Principles of Nutritional Support

Within the framework of this protocol, nutrition is regarded as a physiological instrument linked to and complementary to the training process. Training without an adequate nutritional background does not ensure full structural adaptation and depletes the maternal organism's biological reserves. Physical load acts as a stress stimulus, while nutrients serve as the plastic and energetic material for the implementation of the adaptive response.

The basic principles of nutritional support fully exclude any restrictive diets. Nutrition must be isocaloric or include a light surplus corresponding to the gestational age. Maintaining a stable blood glucose level is the foundation for preventing energy crashes, toxicosis, and gestational diabetes. Cellular provision,

Table 5

The integrative role of nutrients in ensuring physical adaptation

Nutrient	Biochemical and Physio-logical Function in Synergy with Training	Consequences of Deficiency During Physical Activity
Protein	Provides amino acids for muscle fiber repair and collagen synthesis in the linea alba	Development of sarcopenia, tissue laxity, connective tissue insufficiency
Magnesium	Acts as a calcium antagonist, promoting relaxation of actin–myosin cross-bridges after muscle contraction	Calf muscle cramps, uterine hypertonicity, sleep disturbances

Iron	Component of myoglobin and hemoglobin, ensuring oxygen transport to working muscles	Tissue hypoxia, severe shortness of breath with minimal exertion, chronic fatigue
Omega-3	Modulates the inflammatory response after muscle microtrauma and improves blood rheology	Increased tendency toward thrombosis, prolonged recovery phase after exercise
Water	Maintains gliding between fascial layers and is critical for plasma volume	Reduced tissue elasticity, increased risk of ligament injury, orthostatic collapse

with structural elements such as proteins or minerals, allows myofibrils to recover after loading, while fascial chains preserve elastic properties. Special attention is given to hydration. Water deficiency leads to dehydration of the connective-tissue matrix, increasing its fragility and vulner-ability to stretching. The integrative role of nutrients in ensuring physical adaptation is shown in Table 5.

7.2. Key Micronutrients and Their Food Sources

The methodology emphasizes the priority of acquiring vitamins and minerals from the matrix of whole foods. Food components contain cofactors and enzymes that ensure optimal bioavailability, which is unattainable with isolated synthetic supplements, except in cases requiring medical correction prescribed by a physician (Choi et al., 2025).

Folates are the natural form of vitamin B9, which is necessary for DNA methylation and the synthesis of new cells (Perumal & Gernand, 2025). Dietary sources of folates include dark-green leafy vegetables (such as spinach and kale)’ broccoli’ other legumes and avocado. Dietary iron may be subdivided into heme and non-heme iron. The most bioavailable form is heme iron’ found mainly in red meat’ organ meat (especially liver)’ and poultry. The largest dietary sources of non-heme iron are lentils’ spinach’ and buckwheat. Vita- min C is required for complete absorption.

Calcium is a basic element of osteogenesis (Perumal & Gernand, 2025). Its sources include fermented dairy products such as cheeses and yogurts. Sesame seeds, almonds, sardines with bones, and kale also possess high bioavailability. Magnesium acts as a cofactor in more than three hundred enzymatic reactions. It is contained in significant amounts in pumpkin seeds, dark chocolate with high cocoa content, unroasted nuts, and whole-grain cereals.

Omega-3 fatty acids, above all EPA and DHA, are considered indispensable (Perumal & Gernand, 2025). The most preferable sources are fatty fish of cold seas, such as wild salmon, mackerel, and sardines. Plant sources, including flaxseed and walnuts, contain ALA. This form requires conversion in the organism. Its utilization proceeds with lower efficiency. B-group vitamins and vitamin C participate in antioxidant defense and energy metabolism. Their principal sources are citrus fruits, berries, bell pepper, whole-grain bread, and organ meats.

7.3. Integration of Nutrition and the Training Protocol: The Authorial Linkage Model

The integration of nutrition and training is based on a biochemical dialogue between the muscular and endocrine systems. Current molecular research has demonstrated that mammalian skeletal muscle secretes exerkines’ such as irisin and interleukin-6’ during and after exercise’ leading to an anti-inflammatory cascade. These exerkines and others have been shown to reach the placenta and induce placen-tokines in response (Gao et al.’ 2024). This leads to an increase in angiogenesis’ insulin sensitivity and fetal neurogenesis due to inter-cellular signaling. This cascade is possible only under conditions of adequate nutritional provision.

For practical application of this phenomenon, the Decision Tree model has been introduced into the protocol. This analytical scheme allows the specialist or the pregnant woman herself to flexibly adjust the nutritional component based on current well-being, thereby maximizing the training effect. The integrative decision tree is shown in Figure 4.

For practical application, use the daily three-step condition-correction scheme before the session. First, assess the leading symptom in the morning. Then immediately connect it with the probable deficient link. Only after that, select the loading format

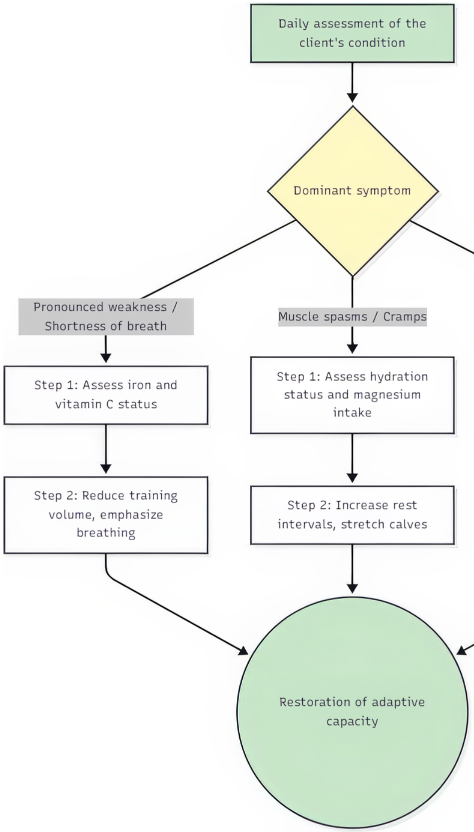

Fig. 4. Integrative Decision Tree: Symptom-Nutrient-Exercise Linkage

for the day. In the presence of weakness and dyspnea, assess nutrition for sufficient intake of iron-rich foods and vitamin C sources, then reduce the session volume to only calm breathing work. In the presence of cramps, increase fluid intake, review magnesium intake, and lengthen rest pauses with gentle calf muscle stretching. In the presence of nausea and a sharp decline in energy, transfer the training session to a period of stable well-being after a meal containing slow carbohydrates. For example, if a pregnant woman in the second trimester experiences weakness and mild dyspnea in the morning, on that day she should choose 15–20 minutes of breathing exercises and calm walking, add buckwheat, meat, or legumes to the diet together with a product containing vitamin C, and return to full training after stabilization of the condition.

CONCLUSION

The functional method presented in this guide forms a new paradigm of prenatal support. The period of gestation is regarded on substantiated grounds as a window of unique physiological adaptations that require measured and biomechanically calibrated support. Total hypodynamia is excluded from this model. The central idea of the methodology, safe and functional pregnancy without fear of movement, is realized through strict adherence to the basic principles.

The key conclusion of the study is that integrating 360° breathing and controlling intra-abdominal pressure are critical factors in protecting the connective tissue of the anterior abdominal wall and the structures of the pelvic floor from destructive overload. The trimester-adapted approach ensures a smooth transformation of goals: from activation and management of toxicosis in the first trimester to rigid pelvic stabilization in the second, and then to decompression and preparation for childbirth in the third.

The ready-made algorithm provides comprehensive tools for safe management of a woman at any gestational age. The memo for home use recommends that clients incorporate elements of the protocol into their everyday routine while preserving postural control during daily movements. Adaptation of the protocol to season and climate is reduced to modulation of the drinking regimen and the mineral density of the diet, above all, potassium and magnesium, during periods of high temperatures.

The method's applicability must be emphasized. The protocol has been developed exclusively for the management of physiologically progressing, uncomplicated pregnancy. In the presence of any medical contraindications, cervical insufficiency, placenta previa, severe forms of gestosis, any physical interventions are permissible only after in-person consultation and direct authorization from the attending obstetric physician.

The prospects for developing the presented functional approach lie in creating a symmetrical, continuous protocol for early and late postpartum recovery. The biomechanical principles of work with the intra-abdominal cylinder and the nutritional support described in this work create an ideal foundation for rapid and safe rehabilitation of the maternal organism after delivery.

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Anastasiia Shapovalova

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for obstetricians-gynaecologists, perinatal physiotherapists, prenatal trainers, nutritionists and adaptive physical culture specialists

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