Treating and Preventing Common Postpartum Musculoskeletal Injuries: A Biomechanical Approach to Moving with Your Baby

Common Postpartum Musculoskeletal Injuries

1. Painful coccyx (coccydynia)

Biomechanics

The sacrococcygeal ligaments, sacrospinous ligaments, and sacrotuberous ligaments attach to the coccyx, providing stability and support to the region.[1] These ligaments increase in laxity during the pregnancy and postpartum periods due to the presence of certain hormones that help orchestrate the necessary changes to sustain life in the womb.

The hormones estradiol and progesterone have been shown to correlate with progressive laxity throughout the pregnancy. A study by Hart et al concluded that estrogen influences relaxin receptor expression. The hormone relaxin has been long-suspected as causing the increase in ligamentous laxity throughout the body though the exact mechanism is unclear.[2] A 2019 study by Cherni et al. found laxity in pregnant women (measured by Beighton's score and extensometer) to reach its maximum at the second trimester.[3] Relaxin does decrease after birth; however, it can take up to 5 months for relaxin levels to return to pre-pregnancy values. These hormones also stay present as long as the mother is breastfeeding.[4] This increased laxity causes the ligaments around the vertebral column, sacrum, and coccyx to loosen. The combination of this increased laxity around the coccyx and the increased weight on the coccyx due to pregnancy-related weight gain increase a postpartum woman's likelihood of developing coccydynia.[5,6]

Coccyx hypermobility can also be a contributing factor to coccydynia. Normal mobility is between 5 and 20 degrees. Coccyx mobility is measured by comparing radiographs of the coccygeal angles in standing versus sitting (see Figure 1 below).[7] Identifying hypermobility of the coccyx can help inform best intervention approaches.

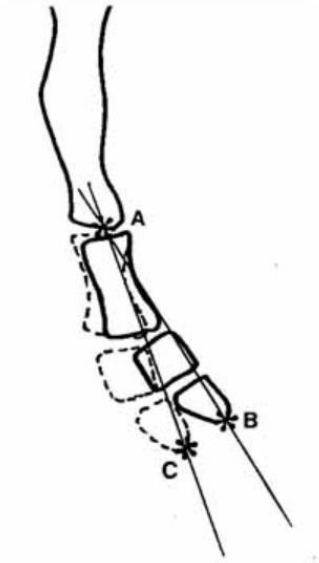


Figure 1. "Range of motion of the coccyx is measured in degrees (angle ABC). Bold line: standard film [in sitting position]. Dotted line: coccyx in standing position. A: apex of the angle located at the caudal part of the sacrum. The subject is facing to the right."[7]

Another cause of coccydynia is coccygeal fracture or luxation. During delivery, the coccyx is pushed posteriorly by the baby's head. If this occurs forcefully, coccygeal fracture or luxation can result. Coccyx luxation is usually in the posterior direction and is the cause of 20% of postpartum coccydynia cases. Coccyx luxation can be observed via dynamic radiography in a seated position. The use of forceps during delivery increases the risk of developing coccydynia.[5]

Increased weight is also a risk factor for developing coccydynia.[5] While average postpartum overall weight retention is small (1.1-3.3 pounds), it takes 6-12 months to return to one's pre-pregnancy weight.[8] Repetitive or prolonged sitting is also a risk factor for coccydynia.[1] Postpartum women spend increased time seated with baby while nursing, thus increasing the "weight" on the coccyx. A heavier individual demonstrates decreased anterior pelvic rotation when seated. This leads to a more vertical position of the sacrum and coccyx in sitting, causing greater pressure on the coccyx. Sacral sitting similarly causes a more vertical position of the coccyx.[5]

Interventions

1. *Conservative Interventions*

90% of coccydynia cases resolve successfully with conservative treatment.[1]

Ergonomic adaption: Wedge-shaped cushions with coccyx-region cut-outs decrease pressure on the coccyx in the seated position. This is preferable to a donut cushion which may actually increase pressure on the coccyx by minimizing the surface area of contact to just the ischial tuberosities and coccyx.[1,5]

Figure 2."Kabooti" coccyx cut-out cushion[9]

Postural education: Sitting upright with good lumbar support anteriorly rotates the pelvis which decreases the pressure directly on the coccyx. Leaning back while sitting (or sacral sitting/slouching) increases pressure on the coccyx by positioning it more vertically.[1,5] A physical therapist can train patients on how to adjust their seated posture and set up their chair/desk areas to encourage better posture and decreased strain on the coccyx.

General physical therapy manual therapy: Stretching the piriformis and iliopsoas muscles have been shown to improve duration of pain-free sitting for people with coccydynia. Maitland's rhythmic oscillatory thoracic mobilization on hypomobile segments have also been shown to be effective in decreasing coccyx pain, though the mechanism of how it helps is unclear.[10]

Analgesics: NSAIDs are commonly used to decrease coccyx pain. No research exists on topical analgesics for coccydynia.[1,5] A 60-patient study found that a capsaicin patch used for 60 minutes with cold packs used before, during, and after application to minimize burning sensation was shown to improve pain by 63% in 37% the study population.[10]

Psychotherapy[1]: Tensing the pelvic floor musculature is a common physiological response to stress and anxiety. Post-traumatic stress disorder and sexual trauma particularly increase one's likelihood of developing coccydynia and increase one's likelihood of the pain becoming chronic.[11] Therefore, psychotherapy can greatly help reduce an underlying cause of a physiological stress response.

Pelvic floor manual therapy: Pelvic floor muscle spasms may cause coccydynia as these muscles attach to the coccyx. Soft tissue massage of levator ani muscles, stretching of levator ani muscles, intra-rectal manual manipulation, and neuromuscular reeducation of spasming muscles may relieve coccyx pain.[1,5,10,12] A pilot study comparing manual treatment techniques for coccydynia on 75 subjects found overall effectiveness to be fairly low. Only 25.7% of subjects had a >60% decrease in pain in 6 months. Levator ani massage and stretching was found to be more effective than sacrococcygeal mobilization. Mobilization was only effective in patients with normal coccyx mobility. However, due to the small sample size and minimal treatment success, none of these findings were statistically significant.[12]

2. *Invasive Interventions*

Guided injection at coccygeal disk or tip of the coccyx: Ultrasound-guided or fluoroscopy-guided steroid injections at the coccyx can cause good pain relief. This method should be utilized only if conservative treatment has not been effective. This method should be tried before surgery.[5,10]

Coccygectomy surgery: Some sources say this method is not recommended as it often causes further problems and does not resolve the pain.[1] The most common complication is wound infection due to the surgical wound's proximity to the rectum. However, a more recent systematic review on coccydynia interventions state a growing amount of evidence supporting this procedure for severe cases of coccydynia.[10]

2. Abdominal muscle separation (diastasis recti abdominus)

Biomechanics

Diastasis Rectus Abdominus (DRA) affects the majority of pregnant women. It often develops during the 2nd trimester as the growing baby stretches the abdominal muscles. A 2016 study by Sperstad et al. studied the prevalence of DRA among 300 women throughout their pregnancy and postpartum period. At 21 weeks of pregnancy, 33.1% of women had developed DRA. At 6 weeks postpartum, 60% had DRA. At 6 months postpartum, 45.4% had DRA. At 12 months postpartum, 32.6% had DRA.[13] The presence of postpartum DRA increases one's risks of other postpartum complications such as pelvic instability, postural changes, and lumbar pain.[14]

The hormones relaxin, progesterone, and estrogen contribute to increased laxity of the linea alba. The mechanical changes of increased anterior pelvic tilt and lumbar lordosis in pregnancy further strain the abdominal region. The stretching and lengthening of the rectus abdominus muscles in pregnancy impairs the woman's abdominal control and functional strength during pregnancy and after birth.[14]

Women with DRA have an increased risk of postpartum abdominal and pelvic pain.[14] The deep abdominal muscles and pelvic floor muscles co-contract synergistically.[15] Therefore, women with DRA often have pelvic floor muscle weakness as well. Women with DRA are also at an increased risk for developing "stress urinary incontinence, fecal incontinence, and pelvic organ prolapse" in the postpartum period.[14]

The pelvic floor muscles, transverse abdominus, diaphragm, and deep multifidus muscles form a "cylinder" that maintains optimal pressure in the trunk to support the spine and pelvis during movement.[14] DRA causes the abdominal component of this pressure system to be less functional. When the linea alba and rectus abdominus are stretched, they cannot provide a normal level of abdominal compression. This causes trunk instability with movement.

A way to functionally assess the core is with a supine active straight leg raise. Excessive pelvic and lumbar movement indicates poor transfer of load and pelvic instability. This can be due to impaired functioning of the abdominal muscles from DRA.[16]

Interventions

Therapeutic exercise: The goal of the following exercise protocols is to improve the core's function by strengthening the deep abdominal muscles, particularly the transverse abdominus. The transverse abdominus can pull the stretched linea alba taut when it is contracted, thus taking

up the “slack” and helping the core move as a functional unit. This improves the integrity of the abdominal compression system and is the backbone of DRA physical therapy treatment.[16]

The following protocols have been found to be effective in minimizing DRA and improving functional mobility of the core for patients with DRA.

Nobel exercises

Noble et al. found the following exercise to improve postpartum rectus abdominus separation at both the level of the umbilicus and above the umbilicus when performed with the parameters detailed below.

- Patient in a supine, hooklying position with their hands crossed and placed on their abdomen. Patient pulls hands together to approximate the rectus abdominus and lifts head to activate the rectus abdominus while exhaling. Patient holds this position for 3-5 seconds, relaxes, then repeats 25 times. This should be performed twice a day for a total of 50 repetitions per day. If this becomes too easy, patient can add a posterior pelvic tilt to the head lift for increased rectus abdominus activation.
- The rectus abdominus muscles can also be approximated with a sheet for this exercise as shown in Figure 3.

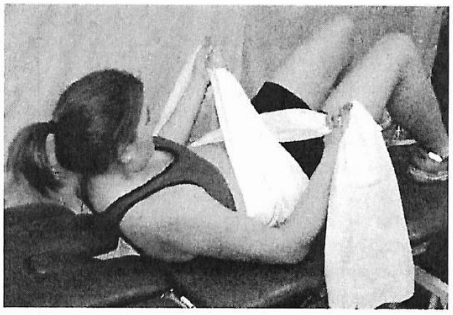


Figure 3. [17]

Thabet et al. study protocol

Thabet et al. compared the effectiveness of a traditional abdominal exercise program to a “deep core stability-strengthening program.”

Traditional program exercises (control group):

- Static abdominal contractions
- Posterior pelvic tilt
- Reverse sit-ups
- Trunk twists
- Reverse trunk twists

Each contraction was held for 5 seconds followed by a 10 second relaxation for 3 sets of 20 repetitions. These exercises were performed daily for 8 weeks.

Deep core stability/strengthening program (experimental group):

- Abdominal bracing with a large towel or sheet held around the abdomen

- Diaphragmatic breathing
- Pelvic floor muscle contractions
- Planks
- Isometric abdominal contraction
- The traditional program exercises listed above

Each contraction was held for 5 seconds followed by a 10 second relaxation for 3 sets of 20 repetitions. These exercises were performed daily for 8 weeks.

This study found the deep core stability/strengthening experimental group to have a "highly statistically compelling decrease" in inter-recti separation ($P<0.0001$) and an improvement in quality of life questionnaires compared to the traditional exercise group. Strengthening the deep core muscles with these exercises helps decrease DRA as these muscles act as a "muscular corset" that supports the spine and low back. The researchers suggest performing these exercises in the "early post-natal" period for those with DRA.[14]

Sahrmann's abdominal exercise progression protocol

This progression of exercises is appropriate for DRA treatment by progressively strengthening the deep abdominal muscles for improved trunk stability. The patient progresses to the next-level exercise when 20 repetitions can be performed of the current level without discomfort or loss of form. Each exercise starts in a supine hooklying position. The patient begins with an inhale followed by an exhale with abdominal contraction or "set." The patient keeps the abdominal contraction for the duration of the repetition, relaxing after each repetition. Each movement is performed with each leg in an alternating pattern.

Progression of exercises:

1. Slide heel on the ground to extend leg, then return to hooklying.
2. Bring leg to 90-90 position, extend leg with lower leg staying parallel to ground until foot is hovering over ground. Then bring heel to ground and slide heel along ground back to hooklying position.
3. Bring one leg into 90-90 position, followed by the other leg. Then slowly lower one leg down so that the foot is *touching the ground* (keeping the knee bent), then bring it back up to 90-90 position.
4. Bring one leg into 90-90 position, followed by the other leg. Slowly extend leg with lower leg staying parallel to ground until foot is *hovering over ground*. Then bring leg back up to 90-90 position.
5. Bring one leg into 90-90 position, followed by the other leg. Then straighten both knees so feet are pointed towards the ceiling. Lower both legs (keeping knees straight) only as far as the patient can keep a neutral spine. Then return legs to starting position. To finish, bend both knees, then lower one foot at a time.[17]

Pelvic floor muscle contractions

The Thabet et al. study supports any postpartum woman practicing pelvic floor muscle contractions in the first 6 weeks postpartum for both DRA treatment and general prevention of

common postpartum issues such as urinary incontinence and pelvic organ prolapse.[14] As these muscles co-contract with the transverse abdominus, increasing their tone helps support the deep core. This improves the functional pressure control system of the abdomen and therefore improves urinary incontinence, prolapse, and DRA symptoms.[14,15]

Breathing with functional movement: Breathing mechanics with functional movement should be taught to help the patient optimize the transverse abdominus for core stability with common movements. These common functional movements include squatting to pick something up from the floor, climbing stairs, moving in bed, and bending over to pick up an infant from their crib. Because the transverse abdominus contracts with exhalation, the patient should exhale when performing the "harder" phase of motion such as the up-phase of a squat.[17] Not only does this contract the transverse abdominus during the movement, but it also helps prevent breath-holding which can stress the abdominal pressure-regulation system and further stretch the linea alba.

Biofeedback: Kinesiotaping to approximate the abdominal muscles as shown in the picture below can provide proprioceptive input to the brain to encourage more vertical alignment and improved contraction of the rectus abdominus. This can be used when training the patient to perform functional movements in tandem with correct breathing mechanics as detailed above.[17]

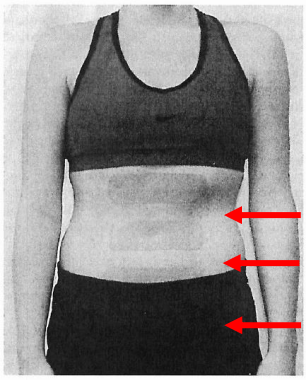


Figure 4. "Kinesiotaping during abdominal exercise"[17]

If a patient struggles activating the transverse abdominus, have them look at their abdomen with a mirror while coaching them. They should see a difference of the linea alba when contracting the rectus abdominus *with* the transversus abdominus versus contracting just the rectus abdominus. The patient can also place their fingers on the diastasis recti to feel the tautness of the soft tissue when they activate their transverse abdominus.[17]

3. Upper back/thoracic pain

Biomechanics

A postpartum woman experiences several body changes that stress the thoracic paraspinal muscles. She carries more weight anteriorly, has an increased kyphosis angle, and has increased ligamentous laxity.[2,3,6,8,18] Thoracic pain is a common postpartum condition treated by physical therapists.[19,20]

Thoracic kyphosis refers to the curve of the thoracic spine. The angle of kyphosis measures the degree of curve of the thoracic spine by drawing a straight line through the superior endplate of T4 and the inferior endplate of T12 (Figure 5).[21]

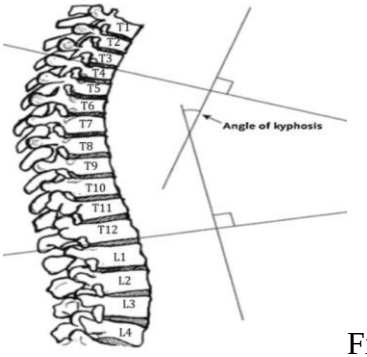


Figure 5. Angle of kyphosis[21]

The angle of kyphosis for pregnant women is at minimum 3.5 degrees greater than nonpregnant women.[18] The angle of kyphosis increases for pregnant and postpartum women due to the increase in anterior load of their changing body and from the increase in anterior load from baby caretaking tasks.

A woman with a normal weight (BMI between 18.5 and 24.9) will gain 37 to 54 pounds during pregnancy. Much of this weight gain is on the anterior part of the body due to breast enlargement (up to 3 pound weight increase) and the expanding womb consisting of a uterus (2 pounds), placenta (1.5 pounds), baby (average 7-8 pounds), and amniotic fluid (2 pounds) (Figure 6).[5,6] While much of this is shed during delivery, the mother continues to have increased breast weight and still holds the baby's weight postpartum via carrying baby. This weight only increases as baby grows and the kyphosis angle can further increase. A mother of a newborn baby will breastfeed 8-12 times in 24 hours.[22] Therefore, the mother will spend a large portion of the day in a seated position holding baby anterior to their body. This anterior weight taxes the thoracic paraspinal muscles which work to keep the spine upright.

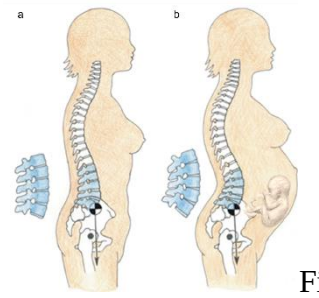


Figure 6. Changes in spine from anterior weight increase[23]

The increase in weight on the anterior body causes the back muscles to become overworked, fatigued, stiff, and achy. Continued overuse can cause pain. Because the baby is held at chest-level during feeding, the thoracic-level paraspinal muscles work the most to maintain erect posture. Because it can take up to 5 months for a mother's relaxin hormone to return to pre-pregnancy levels, her vertebral joints can stay hypermobile into the postpartum period. The

already-overworked paraspinal muscles must work even harder to maintain erect posture of the hypermobile thoracic spine.[2–4]

Much of the activities of daily living of a new mother involve holding or transferring their baby out in front of them. Examples include transferring baby to and from the car, a changing table, or a crib. Slumped shoulders due to fatigued periscapular and thoracic paraspinal muscles cause further increased thoracic kyphosis. The lengthened thoracic back muscles in this position cannot exert optimal force.[24] In conclusion, the anterior body weight increase, increased thoracic kyphosis, increased ligamentous laxity, and poor body mechanics with daily activities strain the thoracic spine.

Interventions

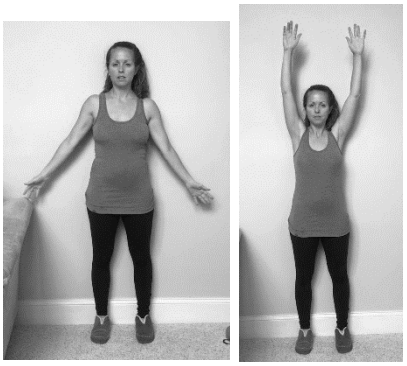
Postural re-education: Achieving a more erect posture will improve the length-tension relationship of the paraspinal muscles and shorten the flexion moment arm acting on the upper back. This will lessen the work load of the paraspinal muscles. Having the patient stand against a wall, trying to bring the back of their head and posterior shoulders to touch the wall can help train erect posture.[17] Kinesiology taping of the upper back and shoulders has been shown in case studies to improve rounded shoulder posture for sedentary females with upper back pain. The tape should be secured superiorly and applied in the posteromedial direction to prompt activation of the paraspinals and periscapular muscles for improved back support as pictured below.[25]


Figure 7.[25]

Manual therapy: Pain generated from strained, fatigued thoracic paraspinal muscles can improve with soft tissue massage and manual trigger point release. Soft tissue massage in the direction of the muscle fibers improves blood flow in the region, loosens the stiff muscles, and breaks bonds between fibers.[26] A 2020 study found effleurage soft tissue massage to not only improve blood flow in the direct region of massage, but also the surrounding regions.[27] Light stroking massage can decrease pain via gate control theory. Heavy pressure massage can decrease pain by stimulating the release of endogenous opiates.[26] Massage has also been shown to decrease stress hormones in postpartum adolescent women.[28] Posterior-anterior mobilizations of the thoracic spine can also improve thoracic pain, mobility, and posture.[19]

Self-mobilizations: Mobilization of the thoracic spine can improve mobility, decrease stiffness, and help correct poor posture. It is recommended that after nursing, a mother stand with her back touching a wall and slide her arms up and down along the wall (as if she is doing a standing snow angel) while trying to keep her back, head, and arms all touching the wall. When her arms are highest, she should hold that position for at least 30 seconds. This encourages erect posture,

invites mobility in the thoracic region after an extended time of immobility in a hunched position while nursing, and encourages activation of the posterior thoracic and periscapular muscles.[17]

 Figure 8.

A mother can perform self-posterior-anterior thoracic mobilizations by sitting in a chair and extending her spine backwards while crossing her arms across her chest. This encourages spinal extension to counter the flexion forces she experiences throughout the day from ADLs requiring an anterior load.[19]

A mother can perform self-soft tissue massage by standing against a wall with a tennis ball between her thoracic paraspinal muscles and the wall. She can bend and straighten her knees to roll the ball up and down these muscles to massage them.[29]

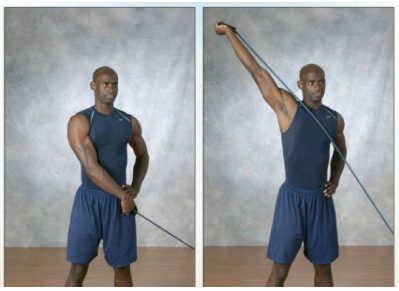
Heat: The application of a heating pad on the thoracic spine can relieve achiness and pain. A pregnant woman should not lie supine on the heating pad as that may cause burns or supine hypotensive syndrome.[30] A seated position or supine position with pillow around the abdomen creating a space for the belly is best. Heating pad temperature of 99-104 degrees Fahrenheit is recommended for pain control. A temperature of 104-110 degrees Fahrenheit is recommended to increase soft tissue extensibility.[31]

Stretching: Stretching tightened pectoral muscles can help achieve more erect posture and decrease thoracic discomfort. This can be easily done with a standing pectoral wall stretch facing the corner.[19,20] This can also be achieved by laying supine with pillow support and arms extended to the side, as pictured in the below restorative yoga position.[32] If pregnant, this position should only be held for 4 minutes at a time to avoid supine hypotensive syndrome.[30]

 Figure 9.[32]

Strengthening: Strengthening the posterior chain back muscles and the periscapular muscles helps maintain erect posture throughout the day. This should not be done if the patient is experiencing acute thoracic pain or discomfort. Incorporate these exercises when the patient's pain has subsided and her mobility has normalized. For strengthening, a standing D2 flexion

proprioceptive neuromuscular facilitation pattern with an exercise band is recommended as pictured in Figure 10. Banded standing shoulder extension is also recommended for strengthening the lower trapezius muscle for improved back support.[17]

 Figure 10.[33]

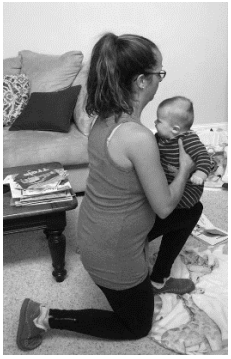
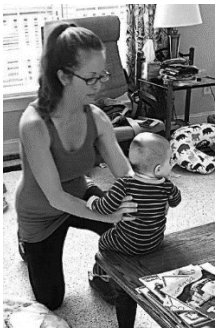
Ergonomic ADL training: Correct body mechanics should be taught for common caretaker ADLs such as lifting a child, changing diapers, transferring baby to and from car seat, etc. Correct biomechanics will optimize the length-tension relationship of the back muscles, enabling them to produce greater force and fatigue less rapidly. Correct body mechanics will also put less strain on the vertebral ligaments. This topic is expanded in the following section.

Biomechanical Recommendations for Common Caretaker ADLs to Avoid Musculoskeletal Injury

General infant handling recommendations

- *Exhale with hardest phase of movement*
    - Exhale during the hardest phase of the movement, such as the "up-phase" of lifting a child. Exhaling co-contracts the pelvic floor muscles and deep abdominal muscles to stabilize the back. Exhaling during the hardest phase of the movement also lessens the pressure on the pelvic floor and abdominal muscles by preventing breath-holding. Breath-holding can stress a healing diastasis rectus abdominus, stress a healing perineum, and worsen stress urinary incontinence.[14–17]
    - Begin exhale through pursed lips, then perform lift while completing the exhale. This helps activate the deep core and pelvic floor muscles during the hardest part of the lift. Inhale afterwards.
- *Set shoulder blades before lifting*
    - Before lifting your baby, bring your shoulder blades towards your spine so that your upper back and shoulders feel supported and stable. This activates the muscles around the scapula and thoracic spine to support the load, thus lessening the stress placed on the joints and ligaments of the shoulder and spine. Try to have your back straight, bending at the hips instead of bending the spine to reach the child.[17]
- *Lift vertically*
    - A 2013 study by Vincent et al. analyzed several potential risk factors for back pain among mothers who lift their children regularly. High risk factors were reaching horizontally with infant and twisting at the trunk while holding infant. Therefore, when handling a child, you should attempt to only lift vertically while holding the infant directly in front of you and close to your body. Pivot with your feet to turn your body instead of twisting at the trunk.[34]
- *Manipulate your environment*
    - A 2012 study by Vencent et al. also found lifting the child above the level of the shoulder or below the level of the thigh to be a high risk factor for developing back pain. "Seated handling" of an infant and "moving at a relaxed pace" (not rushed) were found to lessen one's risk of low back pain. One should manipulate the environment or their body position to not have to lift the child above the level of the shoulder or below the level of the thigh. This can be done by sitting or kneeling before lifting the infant or by utilizing a countertop to support the child while the lifter changes position. This requires breaking the lifting movement into multiple segments. This is explained in more detail in the following "Getting up and down from floor with baby" section below.[34,35]

Getting up and down from floor with baby

- ***Powerlift*** *– Good choice for young babies that do not yet have head control*
  - Fully squat, bringing hips straight backward and down towards ground so that bottom is almost touching ground (yogi squat position). Bring baby into arms, hugging baby close to your body. With chest and head up, stand up with your leg muscles, maintaining the natural curve of your back.[17]
  -   
- ***Tripod lift*** **-** *Good choice for older babies who have developed head control*
  - Begin half kneeling, bring baby to knee while keeping back straight, then rise in the lunge position. This method breaks the movement up into two phases to avoid excessive trunk bending which can stress the back.[17,35]
  -   
- ***Coffee table support*** **-** *Good choice for older babies who have head <u>and</u> trunk control*
  - If one has back pain or weakness, place the baby on a raised surface while you are seated on the ground. Then stand while keeping a hand on the baby for support. Then semi-squat to lift baby into your arms.[35]
  -   

Lifting baby in and out of crib

- *Crib/environmental adjustments*
    - If crib height is adjustable, bring crib mattress to the highest level possible where the baby is still safe. This enables you to not have to bend over as much to reach child. Utilize a bassinet in the early infant stage as bassinets are higher which makes it easier to reach infant.
    - Avoid positioning crib in the corner of a room as that makes accessing the far sides of the crib difficult.[17]
- *Lifting mechanics*
    - Stand at an oblique angle to the crib and partially squat to reach child. Before lifting, slide child to as close to your side of the crib as possible. Then lift child out of crib using a dead lift form (back straight, bending at the hips, knees bent slightly) holding child as close to you as possible to minimize the anterior load.[17,35]

Infant car seat

- *Putting child in and out of car seat*
    - Place one foot in door before lifting child out of seat to help transfer your weight closer to the child.[35]
    - Once you've lifted the child into your arms, turn your body by moving your feet, not twisting at the waist to lessen strain on your back muscles.[17]
- *Carrying car seat*
    - Avoid using the car seat as a carrier for long periods of time due to its heaviness and poor ergonomics.

    - Best to carry car seat with both hands in front of your body so that the load is distributed evenly on both sides of your body.[17]
    - Try the below-pictured carrying method ("D1 extension hold") where you loop arm through the carrying bar and grasp the car seat at the side, using the side of your body to support the car seat.[36]
    -

Changing table

- Adjust table height so that baby is at your natural elbow height and you don't have to stoop to change diaper.
- Rest your anterior pelvis against the changing table and bend your knees slightly. If possible, prop one foot on base of changing table or on bottom drawer to bring weight closer towards baby. [17,35]
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Carrying baby

- Baby must be worn on your front facing towards you until 3 months old or until baby has head control. When baby is able to be worn on your back, this method is preferable as the posterior load puts less stress on your back muscles than an anterior load.[35]

- *Carrying baby with no carrier*

Avoid shifting hips to the side when holding baby on one hip as that brings your spine out of alignment and increases stress on your low back.	Instead, carry on side with hips centered, supporting with both arms for better hip alignment.	It is most preferable to hold baby directly in front of you as pictured here so that the baby's load is distributed more semetrically.[17]
✗ 	✓ 	✓✓ 

- *Soft carriers/slings (front pack)*
    - Slowly build up to carrying baby for longer periods of time in a carrier.
    - The lowest part of baby's bottom should be at the level of your waist to avoid pulling you into a slouched position.
    - Carriers with wider, bilateral straps are preferred to those with thin straps or a single cross-body strap. Carriers with wide, bilateral straps spread the weight of the baby more symmetrically and put less stress on the back.
    - Place baby on a higher surface such as a counter before putting baby into front pack if donning infant alone. Utilize high surface when removing infant from carrier to avoid bending at the back.[17]
    - 
- *Framed backpack*
    - A framed backpack can be used when baby has full head and trunk control.
    - Weight of entire backpack with child and other items should not exceed 30% of your weight.
    - Set empty backpack on a high, secure counter before placing child in backpack. Utilize high counter when removing child from backpack to avoid bending at the back.[17]

Breastfeeding

- *In seated position*
    - Avoid "sacral-sitting" (sitting slouched on your sacrum versus on your ischial tuberosities or "sit bones").
    - Use a high-backed chair with lumbar support.
    - Use a breastfeeding pillow to bring baby to breast. Avoid slouching to bring breast to baby.
    - Use a rolled-up towel in addition to the pillow to bring baby's head even closer to breast.[17]

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- *In side-lying position*
  - Place pillow under head, behind back, and between legs for support.[37]
  - 
- *In reclined position*[37]
  - 
- Naturally switch breasts in feeding session. If feeding with bottle, switch hands halfway through to spend equal time on each side.[17]

- *If having tailbone pain*
  - The coccyx can be particularly sensitive to sitting for long periods of time during the postpartum time due to the increased ligamentous laxity caused by hormones produced when breastfeeding.
  - Use a coccyx cut-out tailbone cushion. This is preferable to a donut cushion as the coccyx cut-out cushion specifically off-weights the coccyx and has a slight decline to further take weight off the tailbone.
  - 

”Kabooti” coccyx-cut-out cushion[9]

- *Post-nursing exercise routine*
    - After nursing, stand with your back touching a wall and slide your arms up and down along the wall as if doing a standing snow angel. Try to keep your back, head, and arms all touching the wall throughout the movement. When your arms are highest, hold that position for at least 30 seconds.
    - This will make your back feel less stiff after nursing by mobilizing the thoracic region after the extended period of immobility. It also strengthens the posterior thoracic and periscapular muscles for improved back support.[17]
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