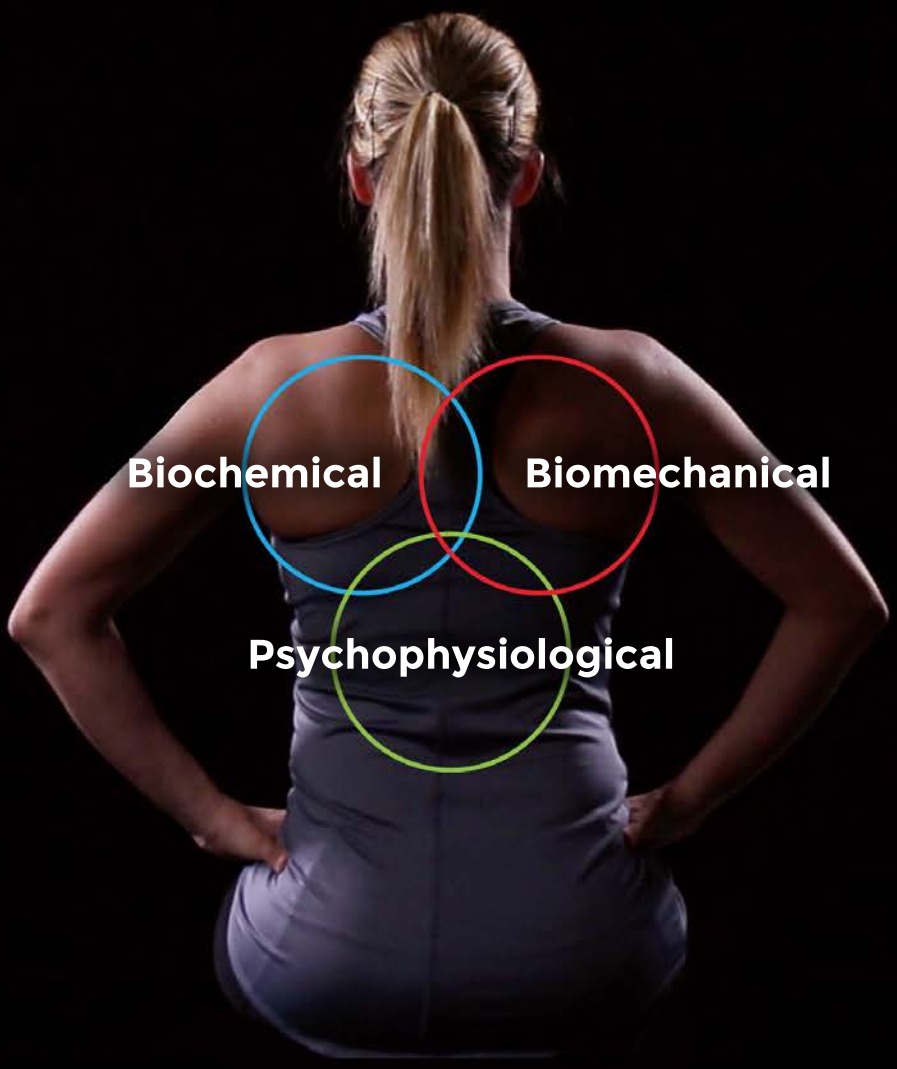
FMS™ move well. move often



SCREENING & ASSESSING BREATHING: A MULTIDIMENSIONAL APPROACH

Version 2

Table Of Contents

Introduction

The presence of dysfunctional breathing affects overall health and musculoskeletal system performance. It contributes to many symptoms and functional disturbances, including those affecting the musculoskeletal system. It can contribute to decreased pain thresholds, impaired motor control and balance, and subsequent movement dysfunction. Each of these impairments adversely affects performance in fitness and rehabilitation. Recent research has exposed that breathing dysfunction is multi-dimensional in nature and includes three (3) primary categories or dimensions of dysfunction, which are the biochemical dimension, the biomechanical dimension, and the psychophysiological / symptomatic dimension.

Due to the complex and multi-dimensional nature of dysfunctional breathing, no single test or screening tool can reliably stand alone to identify the client or patient with dysfunctional breathing. Proper evaluation of dysfunctional breathing needs to be comprehensive and consider all 3 key dimensions and consider causes and contributing factors.

This course is designed for the fitness and healthcare professional to provide the background and details that support functional and dysfunctional breathing. It introduces Dr. Courtney's multi-dimensional "EAARS" model of breathing function and a novel "Breathing Screen." Several tools to assess and test for breathing dysfunction are also provided. Additionally, we introduce a breathing re-training exercise approach, grounded in the neurodevelopmental progression that can be applied in the fitness and rehabilitation settings.
The course is organized into six (6) learning units subdivided into 33 chapters and includes hands-on assessment and treatment demonstrations in a case-study format.

Functional vs Dysfunctional Breathing

The term "dysfunctional breathing" can be somewhat vague as people have used the term to reference a range of breathing behaviors and symptoms, including the following:

People may categorize dysfunction as:

- Hyperventilation and low CO2
- Mouth breathing
- Upper chest breathing
- Inability to take a deep and satisfying breath
- Unexplained breathing discomfort
- Various combinations of these factors

Ask yourself: “What is functional breathing?”

"Functional breathing is breathing that efficiently and appropriately performs primary and secondary functions"

EAARS

Functional breathing has the following characteristics:

1. Efficient
2. Adaptive
3. Appropriate
4. Responsive
5. Supportive

Functions of Breathing

PRIMARY FUNCTIONS OF BREATHING

1. Biomechanical
   a. Refers to the actions of the neuromuscular respiratory pump
   b. Creates changes in the intra-abdominal and intra-thoracic pressure that drive the movement of air, lymph and blood

2. Biochemical
   a. Refers to its effect on blood gases and body chemistry

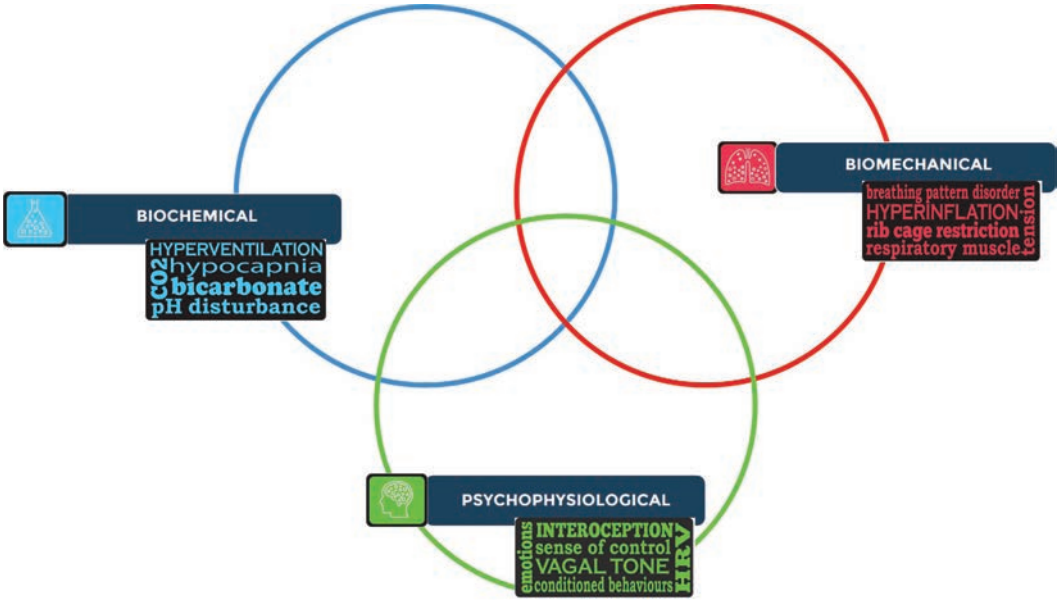
SECONDARY FUNCTIONS OF BREATHING

Breathing plays a very important role in non-respiratory functions such as the following:

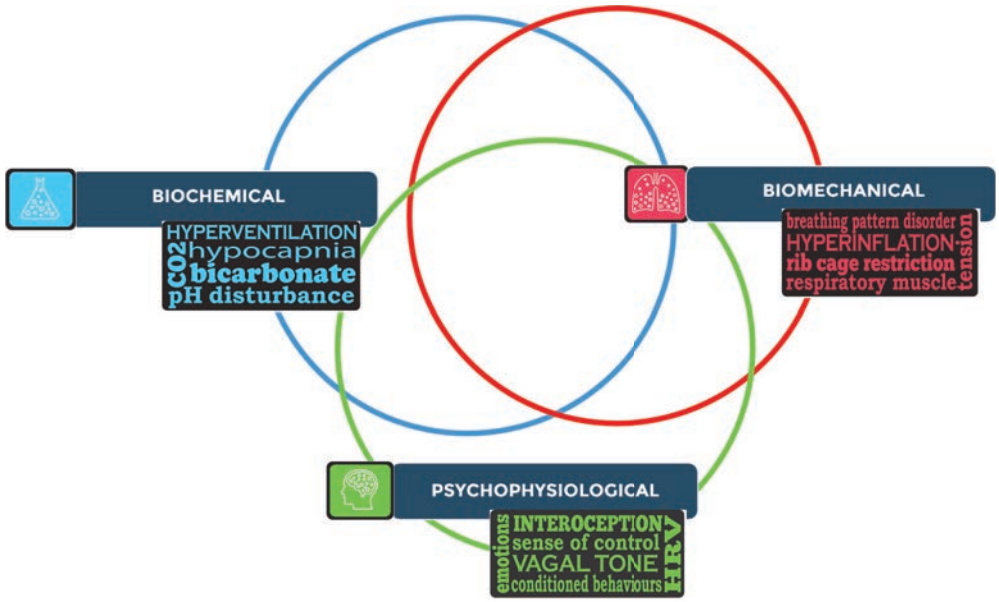
- Self regulation of mental and emotional states
- Speech and vocalization
- Homeostatic rhythms and oscillations
- Spinal stability, posture and motor control

Multidimensional Model

Recent research has exposed that breathing dysfunction is multi-dimensional in nature and includes 3 primary categories of dysfunction: biochemical (CO2, pH), biomechanical (patterns, ribcage movement, respiratory muscles), and the psychophysiological dimension. No single test or screening tool can reliably stand alone to identify the client or patient with dysfunctional breathing. Proper evaluation of dysfunctional breathing needs to be comprehensive and consider all 3 key dimensions as well as causes and contributing factors. Single tests can tend to give information about one dimension while overlooking others.



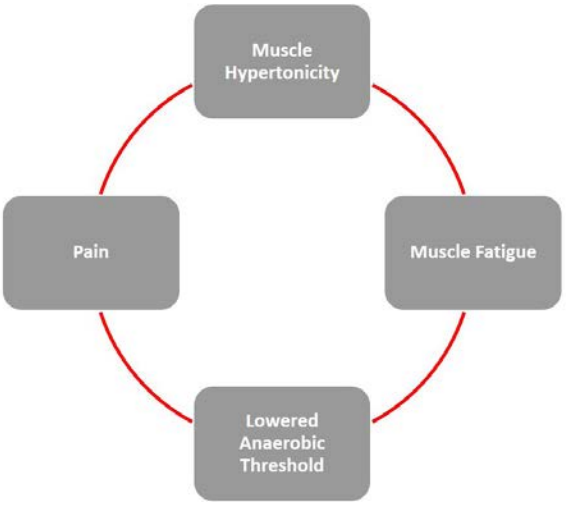
More severe cases of dysfunctional breathing show an overlap of symptoms in each of the 3 domains (see image below).



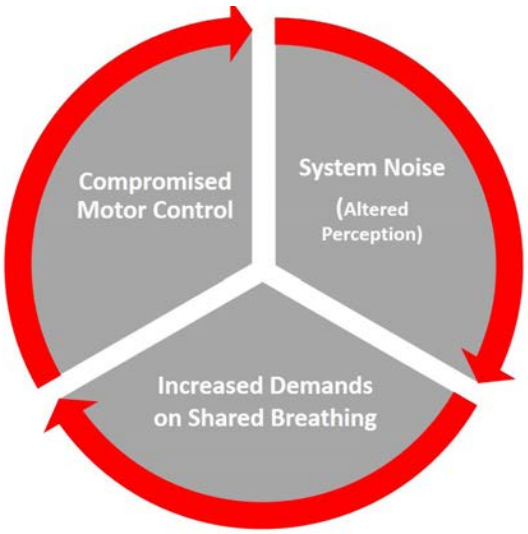
Biochemical Dimension

The biochemical dimension refers to disturbances in oxygen, carbon dioxide and pH. Hyperventilation is the most common disturbance in the biochemical dimension. Hyperventilation means breathing in excess of metabolic requirements with subsequent depletion of CO2. The presence of hyperventilation occurs when breathing in excess of metabolic requirements leads to the depletion of CO2. People with chronic hyperventilation can have abnormal breathing control and inaccurate breathing perception. They tend to abnormally increase rather than decrease ventilation levels when their carbon dioxide levels decrease. This creates a flywheel effect that perpetuates hyperventilation and hypocapnia. Hyperventilators often feel like they are not breathing enough even though they are over-breathing which also perpetuates hyperventilation. One common characteristic of hyperventilators is that instead of controlling breathing, they tend to amplify the symptoms of hyperventilation and over breathe. This effect can alter an individual's perception of what is normal breathing.

Effects of Hyperventilation:



Effects of Dysfunctional Breathing & Motor Control



Biomechanical Dimension

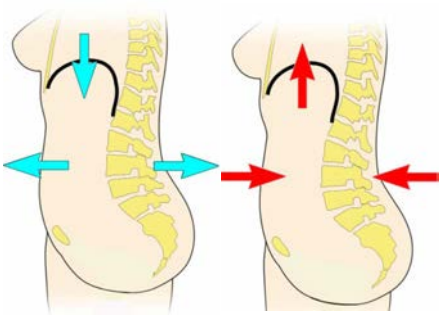
Breathing Pattern Disorders

1. Thoracic/upper rib cage
   a. Vertical upper rib cage, dominant, asynchronous, paradoxical breathing.
2. Excessively irregular breathing
   a. Sighing dyspnea, breath holding
3. Inhalation and/or exhalation schema

Thoracic Breathing Patterns

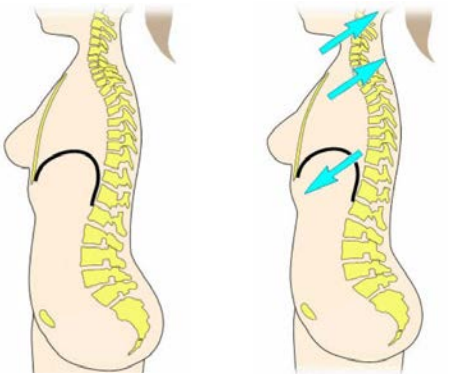
Characterized by rate volume, rhythm, regularity, timing and dominance

Normal



Lower Rib Cage
Abdominal

Abnormal



Upper Rib Cage
Thoracic

Adapted from Dr. Larissa Lasovetskaya.

Direction of movement:

1. Normal - Expansion, outwards motion during inhale
2. Paradoxical - Contraction, inwards motion during inhale

THORACIC BREATHING

Normal - Functional

- Occasional
- Appropriate situation (activity, posture and pathology)
- Supports diaphragm function
- Complex strategy

Abnormal - Dysfunctional

- Habitual / Excessive
- Present lying or at rest
- Recruited too early
- Simplified strategy

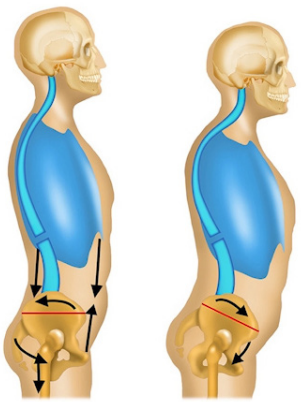
BREATHING, POSTURE & MOVEMENT SCHEMA

Inhalation Schema

- Exhalation restricted
- Flexion restricted
- Inhalation position of rib cage
- Tension patterns - posterior > anterior (hamstring)

Stereotypical Posture of Inhalation Schema

- Hyperboloids with rib flaring
- Tension at TL Junction
- Diaphragm Dysfunction



Exhalation Schema

- Inhalation restricted
- Extension restricted
- Exhalation position of rib cage (expect lower)
- Tension patterns - Anterior > Posterior
- Can include forward head posture

CONSEQUENCES OF BIOMECHANICAL BREATHING DYSFUNCTIONS

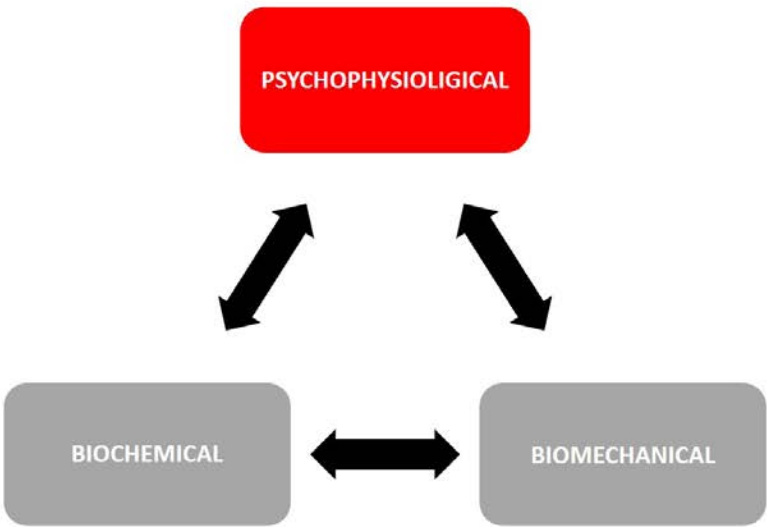
1. Reduced ability to dynamically & accurately regulate intra-abdominal pressure
   a. Poor motor control
   b. Poor spinal support
   c. Poor stabilization

2. Muscle Imbalance - (neck, shoulder, girdle, abdominals, spine and pelvis)
   a. Neck pain
   b. Back pain
   c. Pelvic pain
   d. Incontinence

Psychophysiological Dimension

It is important to understand that mental and emotional states have a large impact on breathing function and breathing symptoms. The way a person breathes -- both consciously and unconsciously -- can affect the function of the brain and nervous system and mental and emotional states.

The psychophysiological dimension influences ventilatory drive and breathing pattern. It impacts breathing control and can perpetuate dysfunction in the biochemical and biomechanical dimensions.



Breathing Assessment

Basic Principles

- Evaluate biochemical, biomechanical and psychophysiological dimensions.
- For each domain, evaluate at rest and under challenge.
- Evaluate breathing in response to and as part of secondary (breathing related function of concern e.g muscular-skeletal).

Breathing Considerations During a Musculo-Skeletal Exam

- Breath holding during motor tasks can be a sign of motor control dysfunction
- Clients may breath-hold in anticipation of pain or movement and can be a conditioned response that persists even after pain is gone
- Flexion/Extension restrictions in relation to inhalation/exhalation dysfunctions: Someone with an extension restriction may also have an inhalation restriction. Someone with a flexion restriction may also have an exhalation restriction
- Breathing restrictions/dysfunctions may also cause restrictions in shoulder mobility, dysfunctional rolling patterns, and balance impairments

Order of Assessment

1. Perform Top Tier SFMA
2. Biochemical Assessment
   a. Observation & Testing
   b. Breath Holds
3. Biomechanical Assessment
   a. Hi-Lo Assessment
   b. MARM Assessment
4. Psychophysiological Dimension
   a. This is indicated when there are large numbers of symptoms on SEBQ and NQ. Also look for positive response to questions asking about stress, tension and anxiety in these questionnaires

THE SELECTIVE FUNCTIONAL MOVEMENT ASSESSMENT

SFMA SCORING			FN	FP	DP	DN
Cervical Flexion						
Cervical Extension						
Cervical Rotation		L				
		R				
Upper Extremity Pattern 1 (MRE)		L				
		R				
Upper Extremity Pattern 2 (LRF)		L				
		R				
Multi-Segmental Flexion						
Multi-Segmental Extension						
Multi-Segmental Rotation		L				
		R				
Single-Leg Stance		L				
		R				
Overhead Deep Squat						

THE SELECTIVE FUNCTIONAL MOVEMENT ASSESSMENT

Name: **Date:** **Total Score:**

Cervical Flexion ☐ Painful

☐ Can't touch Sternum to Chin

☐ Excessive effort and/or lack of motor control

Cervical Extension ☐ Painful

☐ Not within 10 degrees of parallel

☐ Excessive effort and/or lack of motor control

Cervical Rotation ☐ Painful Right ☐ Painful Left

☐ Right ☐ Left Nose not in line with mid-clavicle

☐ Right ☐ Left Excessive effort and/or appreciable asymmetry or lack of motor control

Pattern #1 – MRE ☐ Painful Right ☐ Painful Left

☐ Right ☐ Left Does not reach inferior angle of scapula

☐ Right ☐ Left Excessive effort and/or appreciable asymmetry or lack of motor control

Pattern #2 – LRF ☐ Painful Right ☐ Painful Left

☐ Right ☐ Left Does not reach spine of scapula

☐ Right ☐ Left Excessive effort and/or appreciable asymmetry or lack of motor control

Multi-Segmental Flexion ☐ Painful

☐ Cannot touch toes

☐ Sacral angle <70 degrees

☐ Non-uniform spinal curve

☐ Lack of posterior weight shift

☐ Excessive effort and/or appreciable asymmetry or lack of motor control

Multi-Segmental Extension ☐ Painful

☐ UE does not achieve or maintain 170

☐ ASIS does not clear toes

☐ Spine of scapula does not clear heels

☐ Non-Uniform spinal curve

☐ Excessive effort and/or lack motor control

Multi-Segmental Rotation ☐ Painful Right ☐ Painful Left

☐ Right ☐ Left Pelvis Rotation <50 degrees

☐ Right ☐ Left Shoulders rotation <50 degrees

☐ Right ☐ Left Spine/pelvic deviation

☐ Right ☐ Left Excessive Knee flexion

☐ Right ☐ Left Excessive effort and/or lack of symmetry or motor control

Single Leg Stance ☐ Painful Right ☐ Painful Left

☐ Right ☐ Left Eyes open <10 seconds

☐ Right ☐ Left Eyes closed < 10 seconds

☐ Right ☐ Left Loss of Height

☐ Right ☐ Left Excessive effort or lack of symmetry or motor control

Overhead Deep Squat ☐ Painful

☐ Loss of UE start position

☐ Tibia and Torso are not parallel or better

☐ Thighs do not break parallel

☐ Loss of sagittal plane alignment: Right____ Left _____

☐ Excessive effort, weight shift, or motor control

BIOMECHANICAL TESTING

2 stages in testing:

1. Observation
   a. Muscle signs, posture signs, habits and behaviors
   b. Look for hypertonicity in scalenes, SCM, traps, thoracolumbar region
   c. Look at movement of shoulders, ribcage, umbilicus in 4 positions
2. Test/measurement

Observation in standing

1. Side on
   a. May see forward head, tension in body front vs back
2. Front
   a. Signs of hyperactivity in anterior neck, overdeveloped trapezius, dip above clavicle, may see chest heaving

Assessment of biomechanical dimension in a seated position

1. Observe for muscle hypertonicity and chest or shoulder movement during the breath
2. Can also observe while speaking, looking for gasping, choppy sentences, or speeding up and slowing down

Behind

1. Look for hypertonicity or over-development of the upper traps

Assessment of biomechanical dimension in a supine position

1. Look for direction of umbilicus movement
2. Look for rib flaring or hollowing out of the stomach (both dysfunctional if present)
3. If you are not sure if this is happening, ask the patient to shallowly breathe gently and slowly into your hand placed on the stomach to assess for inactivity or hollowing out of the stomach during inhale

Assessment of biomechanical dimension in a prone position

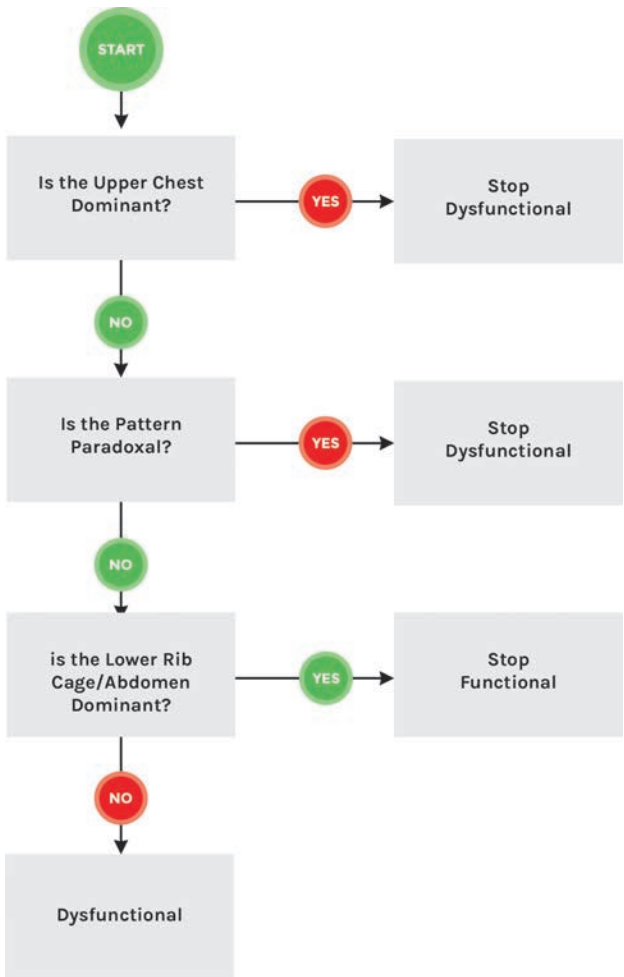
1. Look for direction of umbilicus movement
2. Look for rib flaring or hollowing out of the stomach (both dysfunctional if present)
3. If you are not sure if this is happening, ask the patient to shallowly breathe gently and slowly into your hand placed on the stomach to assess for inactivity or hollowing out of the stomach during inhale

Hi-Lo Test

This test is performed in the sitting position. The clinician stands or kneels at the front and slightly to the side of the patient and places one hand on their sternum and one hand on their upper abdomen to determine whether thoracic or abdominal motion is dominant during breathing. The clinician will demonstrate on themselves where the palpation points will be, and in the case when a female subject is not comfortable with a male clinician performing the test, a female clinician will be made available. They will also check for paradoxical breathing by seeing if the abdomen moves in a direction opposite to the thorax during breathing; this is evident during inhalation if the abdomen moves toward the spine, and during exhalation, if the abdomen moves in an outward direction. Test will assess for up to five (5) breath cycles.

Demonstration

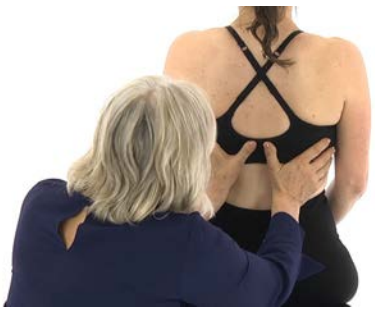
Assessment



MARM Assessment

The Manual Assessment of Respiratory Motion (MARM) was originally developed by Dr. Jan van Dixhoorn. It is used to assess and quantify breathing patterns, and in particular, the distribution of breathing motion between the upper and lower parts of the rib cage and abdomen under various conditions. Research has shown that it is a reliable assessment tool in the hands of trained practitioners (Courtney and Dixhoorn 2009). It does require practice, but once the skills of using this technique and recording findings are acquired, it is a practical and quick technique.

Hand Position



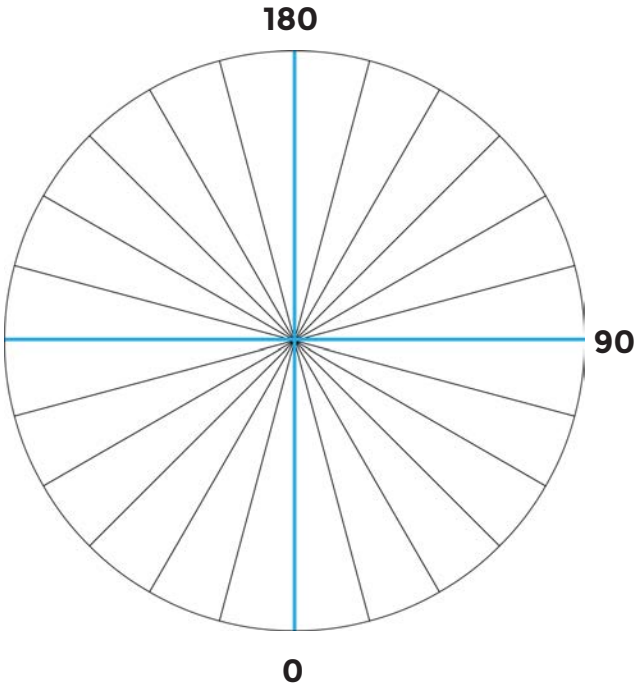
INSTRUCTIONS

1. Sit behind the subject and place both your hands on the lower lateral rib cage so that your whole hand rests firmly and comfortably and does not restrict breathing motion.
2. Your thumbs should be approximately parallel to the spine, pointing vertically and your hand comfortably open with fingers spread so that the little finger approaches a horizontal orientation.
3. Note that the 4th and 5th finger reach below the lower ribs and can feel abdominal expansion.
4. You will make an assessment of the extent of how overall vertical motion of your hands feel relative to the overall lateral motion.
5. Also decide if the motion is predominantly upper rib cage, lower rib cage/abdomen correlatively balanced.

Use this information to determine the relative distance from the horizontal line of the upper and lower lines of the MARM diagram. The upper line will be further from the horizontal and closer to the top if there is more vertical and upper ribcage motion. The lower line will be further from the horizontal and closer to the bottom if there is more lateral and lower rib cage/abdomen motion.

6. Finally get a sense of the overall magnitude and freedom of rib cage motion. Place lines further apart to represent greater overall motion and closer for less motion

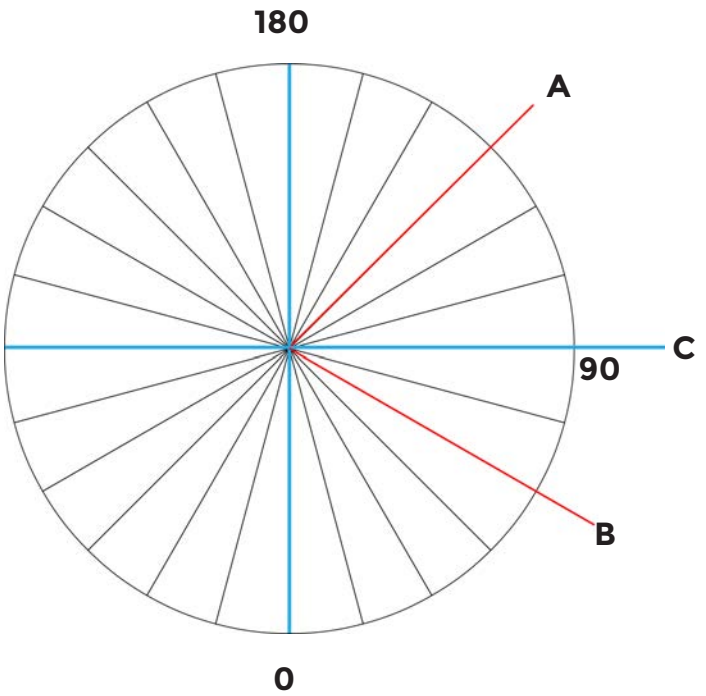
Recording MARM



Draw Upper Line (Line A)
Represents upper rib cage and vertical breathing motion

Draw Lower line (Line B)
Represents lower rib cage and lateral breathing motion

90 degree line (**Line C)**
This is a reference line only



Calculating MARM Variables

- Area = Angle AB
- Average= A+B/2
- Balance= Angle AC (minus) Angle AB
- % Rib Cage=AC/ABx100

The Nijmegen Questionnaire

The Nijmegen Questionnaire (NQ) gives a broad view of symptoms associated with dysfunctional breathing patterns. The Nijmegen Questionnaire was introduced over 30 years ago as a screening tool to detect patients with hyperventilation complaints who could benefit from breathing training.

	Never 0	Rare 1	Sometimes 2	Often 3	Very Often 4
Chest Pain					
Feeling Tense					
Blurred Vision					
Dizzy Spells					
Feeling Confused					
Faster & Deeper Breathing					
Short of Breath					
Tight Feelings in Chest					
Bloated Feeling in Stomach					
Tingling Fingers					
Unable to Breathe Deeply					
Stiff Fingers or Arms					
Tight Feeling Around Mouth					
Cold Hands or Feet					
Palpitations					
Feelings of Anxiety					

Scoring the Nijmegen Questionnaire

Add all number for a total score.
20 indicates Dysfunctional Breathing.

The SEBQ

The Self Evaluation Breathing Questionnaire (SEBQ) measures a number of different types or qualities of breathing discomfort. It also contains questions about dysfunctional breathing behaviors such as mouth breathing. It was developed by Dr. Rosalba Courtney (Courtney, Greenwood 2009) to represent the broad range of symptoms reported to be found in individual with dysfunctional breathing. Research has shown it to be a reliable instrument for testing and retesting. This makes this questionnaire useful for gauging the effectiveness of breathing training.

(0) never/not true at all (2) frequently-mostly true
(1) occasionally/a bit true (3) very frequently/very true

The Self Evaluation Breathing Questionnaire	0	1	2	3
I get easily breathless out of proportion to my fitness				
I notice myself breathing shallowly				
I get short of breath reading and talking				
I notice myself sighing				
I notice myself yawning				
I feel I cannot take a deep or satisfying breath				
I notice that I am breathing irregularly				
My breathing feels stuck or restricted				
My ribcage feels tight and can't expand				
I notice myself breathing quickly				
I get breathless when I am anxious				
I find myself holding my breath				
I feel breathless in association with other physical symptoms				
I have trouble coordinating my breathing when speaking				
I can't catch my breath				
I feel that the air is stuffy, as if not enough air in the room				
I get breathless even when resting				
My breath feels like it does not go in all the way				
My breath feels like it does not go out all the way				
My breathing is heavy				
I feel that I am breathing more				
My breathing requires work				
My breathing requires effort				
I breathe through my mouth during the day				
I breathe through my mouth at night while I sleep				

Scoring the SEBQ

To Score the SEBQ just add the numbers Individuals with scores >= 20 on the Nijmegen on average score >=11 on the SEBQ.

Breathing Screen

The breathing screen was introduced to help identify if people do/do not have a breathing dysfunction. From internal research, we found that breath hold time and 4-Questions have a sensitivity of .89 for ruling out breathing dysfunction. If you pass the screen, we are 89% sure you don't have a breathing problem *(Kiesel, Rhodes, Mueller, Waninger, Butler, 2016).*

BREATH HOLD TIME

Breath holding time is shorter in individuals who have increased ventilatory drive or lowered breathlessness thresholds due to psychophysiological, biomechanical or biochemical factors. Short breath holding time can indicate dysfunction in any of these 3 dimensions.

Breath holding time can be tested in 2 ways:

1. After a normal exhale (also know as functional residual capacity)
2. After a full inhale (also known as total lung capacity)

BREATH HOLDING AT FUNCTIONAL RESIDUAL CAPACITY (FRC)

FRC refers to the volume of air left in the lungs after a normal, passive exhalation. Breath holding at FRC means holding the breath after a normal relaxed exhalation. Breath holding times help gauge an understanding of all dimensions of breathing because the biomechanical and psychophysiological dimensions can also affect outcome of breath holding times.

Instructions

1. Have the individual breathe in, breathe out naturally. At the end of the exhale, ask them to hold their breath by plugging their nose.
2. Tell them to hold their breath until they feel a clear desire to breathe or experience involuntary muscle activity from the diaphragm or other breathing muscles.
3. Start a timer as soon as the individual holds their breath, and stop when they release their nose or you see the first sign of muscle activity.

Tips for testing

- Look for the first sign to breathe. (Normally muscle activity in the stomach or neck)

Interpretation

If time is less than 25 seconds, suspect possible dysfunctional breathing

Breathing Screen

BREATH HOLDING AT TOTAL LUNG CAPACITY (TLC)

TLC refers to the total volume of air in the lungs at maximal inspiration.

Instructions

1. Have the individual breathe in and then breathe out, then take a deep breath in (maximum inhalation) and hold their breath by plugging their nose.
2. Total lung capacity is considered at the end of full inhale. Hold as long as possible until the individual's breaking point.
3. Start a timer as soon as the individual holds their breath, and stop when the individual breathes.

Tips for Testing

- Muscle activity is allowed during this test.
- Clearly instruct the individual to hold as long as physically possible.

BREATHING QUESTIONNAIRE

1. Do you feel tense?

- ☐ (0) never/not true at all
- ☐ (1) occasionally/a bit true
- ☐ (2) frequently-mostly true
- ☐ (3) very frequently/very true

2. Do you feel a cold sensation in your hands or feet?

- ☐ (0) never/not true at all
- ☐ (1) occasionally/a bit true
- ☐ (2) frequently-mostly true
- ☐ (3) very frequently/very true

3. Do you notice yourself yawning?

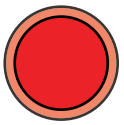
- ☐ (0) never/not true at all
- ☐ (1) occasionally/a bit true
- ☐ (2) frequently-mostly true
- ☐ (3) very frequently/very true

4. Do you notice breathing through your mouth at night?

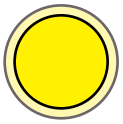
- ☐ (0) never/not true at all
- ☐ (1) occasionally/a bit true
- ☐ (2) frequently-mostly true
- ☐ (3) very frequently/very true

Breathing Screen Interpretation

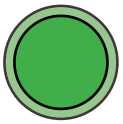
CATEGORIES



Red: Stop. Address breathing dysfunction, prioritize treatment of breathing, and do not load this group with resistance.



Yellow: Some deficits, proceed with caution by monitoring and adding breathing retraining to activity and add some breathing retraining.



Green: Breathing is optimal and individual likely moves very well.

FUNCTIONAL RESIDUAL CAPACITY (FRC)

Red: < 25 Seconds
Yellow: 26 - 35 Seconds
Green: > 35 Seconds

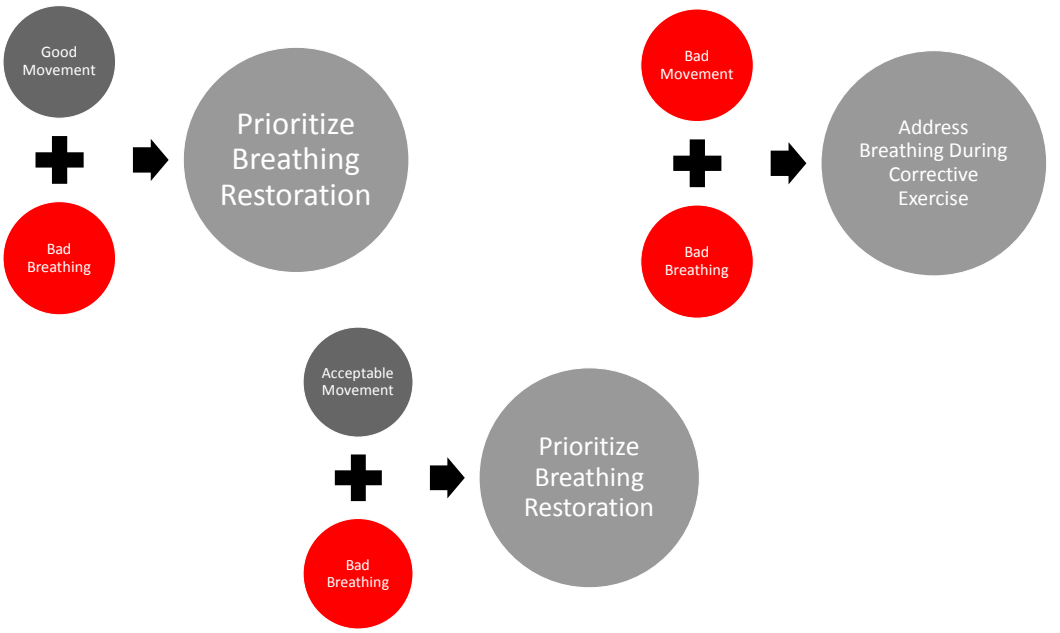
TOTAL LUNG CAPACITY (TLC)

Red: < 35 Seconds
Yellow: 36 - 60 Seconds
Green: > 60 Seconds

BREATHING QUESTIONNAIRE

Red: Score 2 or 3
Yellow: Score of 1
Green: Score of 0

Application of Exercise



TEST, TREAT, AND RE-TEST

You need to have a clear expectation of each breathing drill you apply and how each individual is expected to respond. DO NOT GUESS whether an exercise worked. Retest it and make the appropriate changes until you get the desired outcome in a timely manner. By taking breath hold times at different postures, it allows you to see where their worst posture is for breathing. The breathing drills change breathing mechanics and create short-term responses which can then add up to a long-term adaptation. Remember, every breathing drill presents an opportunity to change an individual's breathing dysfunction. You will either improve the dysfunction or see no change. Retesting is vital in order for you to treat/correct effectively.

Continue on the correct path. If numbers are not changing after 2-3 weeks, you may consider a medical referral.

MOVEMENT INTERPLAY WITH BREATHING

We acknowledge that breathing is not only an essential function for living, but it is also a gateway into sympathetic vs. parasympathetic balance, stress and efficiency in the body. It's important to understand that the breathing screen is designed to tell you when to assess breathing to assist in fixing movement. You learn about a movement by looking at a standard: Performing the SFMA top tier will guide your treatment principles and provide you with a feedback. Re-test the SFMA to look at the degree of change after an exercise to see if it is the correct exercise.

BREATHING AND EXERCISE INTERPLAY

1. Shallow breathing may be the result of being in an unfamiliar position.
2. You can confront a movement restriction while breathing or confront a breathing restriction while moving.
3. By embracing the screen first, it allows exercises to become readily available to you.
4. Creates integrity and systemization.

Entry Point

CROCODILE BREATHING STATIC DIAPHRAGMATIC


Begin in the prone posture by positioning yourself face down, so that your stomach is on the floor with your forehead on your hands, both palms down, one covering the other. Make sure the chest and arms are relaxed, and you are as "flat" as you can get; your neck should be relaxed and comfortable. You should feel that you are on your chest, not on the edge of your ribs.
Breathe in through the nose and feel the air move down past the chest into the "stomach". When this happens, you will feel the abdomen push out against the ground and laterally, this should happen naturally without you forcing your stomach out.

1. Take a nasal inhalation and exhalation
2. Nasal inhalation should be a low, slow 3 seconds
3. Then a brief pause
4. Nasal exhalation should be slow and full 4-6 seconds
5. Then a longer pause (2-3 seconds)
6. Then the next breath cycle
7. The air should expand in a 360-degree fashion filling the cylinder of the abdomen

T-SPINE ROTATION WITH RIB GRAB


Lie on the floor in a side lying position, flex the top hip to 90 degrees and support the knee with a foam roll and keep the pelvis stacked/level. The head is supported by a towel roll. Reach under your ribs with the top hand. Begin by inhaling, then during the exhale, rotate your top shoulder toward the floor and gently pull the ribs in the direction you are rotating. Maintain contact between the knee and the foam roll. Hold the rotation gained and continue to cycle breaths until the rotation has stopped improving. Hold that position and cycle 2-3 more breaths. Then return to the starting position by rotating back to a neutral position. Remember that the inhale may bring you out of your rotation a bit and the exhale should allow you to turn further.

Entry Point

BRETTZEL DIAPHRAGMATIC

Begin laying on either side with one knee up, the other down in a neutral position, and the head supported by a foam pad. Take the hand of the arm that is in contact with the ground and grab the knee that is flexed up and supported by a foam roller at belly button height. Take the other hand and grab the ankle of the leg that is behind the back. If it is too difficult to grab the ankle, then use a towel or strap.
Begin by inhaling and on the exhale start to rotate the top shoulder gently backwards towards the ground. Cycle through this progression and hold the rotation gained and continue to cycle breaths until the rotation has stopped improving. Hold that position and cycle 2-3 more breaths.
Then return to the starting position by rotating back to a neutral position.
Remember that the inhale may bring you out of your rotation a bit and the exhale should allow you to turn further.

Supine FRC - Demonstrate

Begin in the supine posture by positioning yourself face up so that your back is on the floor with knees bent 90 degrees and feet flat on the ground. Neck and spine should be neutral and comfortable. Use a bolster for the neck if necessary.

1. Take a normal nasal inhalation and exhalation.
2. At the end of the exhalation, the client will take one hand up to their nose and pinch the nose closed and pause or breath hold until the first sign of muscular action and desire to breathe. This is not a maximum breath hold, but the functional residual capacity.
3. Record the time.

Supported Spine - Facilitate

CROCODILE BREATHING

Begin in the prone posture by positioning yourself face down, so that your stomach is on the floor with your forehead on your hands, both palms down, one covering the other. Make sure the chest and arms are relaxed, and you are as "flat" as you can get; your neck should be relaxed and comfortable. You should feel that you are on your chest not on the edge of your ribs.
Breathe in through the nose and feel the air move down past the chest into the "stomach." When this happens, you will feel the abdomen push out against the ground and laterally, and this should happen naturally without you forcing your stomach out.

1. Take a nasal inhalation and exhalation
2. Nasal inhalation should be a low, slow 3 seconds
3. Then a brief pause
4. Nasal exhalation should be slow and full 4-6 seconds
5. Then a longer pause (2-3 seconds)
6. Then the next breath cycle
7. The air should expand in a 360-degree fashion filling the cylinder of the abdomen

Supported Spine - Facilitate

CROCODILE BREATHING - SIDE LYING

Begin in the side-lying posture, so that one side of your stomach is on the floor with a small, soft rolled up towel placed in the space between the top of the crest of the hip and the floating ribs. This will give your breath a target and provide proprioceptive feedback during the drill. Make sure the neck and body are relaxed, and in a comfortable side-lying position; your neck should be relaxed and comfortable so you may need a bolster or pillow to find a neutral position.

Breathe in through the nose and feel the air move down past the chest into the "stomach." When this happens, you will feel the abdomen push out against the ground on your side where the soft roll is placed. This should happen naturally without you forcing your stomach out but aiming your breath for the soft roll.

1. Take a nasal inhalation and exhalation
2. Nasal inhalation should be a low, slow 3 seconds
3. Then a brief pause
4. Nasal exhalation should be slow and full 4-6 seconds
5. Then a longer pause (2-3 seconds)
6. Then the next breath cycle
7. The air should expand in a 360-degree fashion filling the cylinder of the abdomen and allowing you to feel the soft roll
8. Repeat on the opposite side

BREATHING - HOOK LYING

Begin in the supine posture by positioning yourself face up so that your back is on the floor with knees bent 90 degrees and feet flat on the ground. Neck and spine should be neutral and comfortable. Use a bolster for the neck if necessary. Place one hand very high on the chest and one hand low on the abdomen (at or below the belly button).

1. Take a nasal inhalation and exhalation
2. Nasal inhalation should be a low, slow 3 seconds
3. Then a brief pause
4. Nasal exhalation should be slow and full 4-6 seconds
5. Then a longer pause (2-3 seconds)
6. Then the next breath cycle
7. The air should hit the lower hand first and the finish of the breath should arrive at the top hand. This is sometimes called low/high breathing
8. Once the low/high breathing is easily performed, move the hands to the sides of the abdomen (just above the iliac crest but below the floating ribs) so that you can feel the lateral expansion of the abdomen equally to both sides.

Supported Spine - Facilitate

SEGMENTAL ROLLING

Lower body:

Lie on your back, hands overhead, feet shoulder width apart. Flex one hip and reach the leg across the body. The upper extremity remains still on the floor until the lower body pulls it over. To return to the starting position, extend and reach the same leg diagonally across the body. Again, the upper extremity remains on the floor and the lower body merely pulls it over.

Watch and listen for any breath holding as the client should not need to breath hold during the rolling patterns.

Upper body:

Lie on your back with the hands overhead and the feet shoulder width apart. In a diagonal pattern, reach one arm across the body, while keeping the head in contact with the floor. The lower extremity remains on the floor until the upper body pulls it over. To return to the starting position, extend and reach the same arm diagonally across the body. Again, the lower extremity remains on the floor and the upper body merely pulls it over. The head always looks at the moving hand. Watch and listen for any breath holding as the client should not need to breath hold during the rolling patterns.

- During the flexion (Supine to Prone) rolls, a relaxed exhale can be encouraged.
- During the extension (Prone to Supine) rolls, an inhalation can be encouraged.

Supported Spine - Challenge

LOG ROLL

Log roll is a coordinated symmetrical supine to prone and prone to supine rolling performed to the left and right. Unlike segmental rolling, the log roll should be performed in "one piece".

Begin the supine posture by laying on your back with the hands overhead and the feet close together. Perform the supine to prone roll by raising the heels and arms slightly off the ground and rolling in one unit to the direction chosen. Pause briefly and return to the staring position by again raising the feet and arms slightly off the ground and rolling in one unit back to the starting position.

- During the flexion (Supine to Prone) rolls a exhale can be encouraged.
- During the extension (Prone to Supine) rolls an inhalation can be encouraged.

Quadruped FRC –Demonstrate

Begin in a quadruped position with the hands placed directly underneath the shoulders and the knees placed directly underneath the hips.

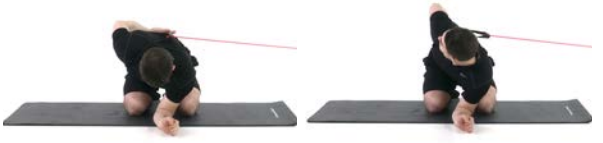
1. Take a normal nasal inhalation and exhalation.
2. At the end of the exhalation, the client will take one hand up to the nose and pinch the nose closed and pause or breath hold until the first sign of muscular action and desire to breathe. This is not a maximum breath hold but the functional residual capacity.
3. Record the time.

Suspended Spine - Facilitate

QUADRUPED FLEXION/EXTENSION

Begin in a quadruped position with the elbows placed directly underneath the shoulders on a stack of pads or padded box so the spine is level and the knees are placed directly underneath the hips. Perform a natural breath cycle in the neutral or starting position. During the next inhale, perform a spine extension (cow pose) articulating the spine into a fully extended position from neck to lower back. Pause briefly at the end range of motion. During the exhale, perform a spine flexion (cat pose) articulating the spine into a fully flexed position from neck to lower back. Again, pause briefly at the end range of motion. You can continue to cycle the movement with the breathing or pause for a breath cycle in the neutral position before performing the drill.

QUADRUPED T-SPINE LUMBAR LOCKED ASSISTED



Get into a quadruped position and sit the buttocks on the heels with the elbows directly under the shoulder and forearms placed together in the center of the body firmly in the floor. Place one hand on your low back, palm facing away from the back. An FMT band is placed around the shoulder of the arm behind the back running across the back toward an attachment point to the side and 45 degrees down from the shoulder. Then, look toward and rotate that shoulder toward the ceiling. The FMT band will assist the turn up into the t-spine rotation. Inhale at the starting position and exhale during the rotation. A pause can be performed at the end range of motion and multiple breath cycles can be performed before returning to the starting position. Return to the starting position and proceed to take the shoulder toward the floor. Keep the post arm firm.

Repeat for the desired number of repetitions/breaths and move the FMT band to the opposite shoulder and repeat on the other side/direction.

Suspended Spine – Challenge

QUADRUPED FOOT TO HAND WITH FLEXION/EXTENSION

Begin in a quadruped position with the hands placed directly underneath the shoulders and the knees placed directly underneath the hips. Begin by stepping one foot up beside the same side hand and perform a natural breath cycle in the neutral or starting position. During the next inhale perform a spine extension (cow pose) articulating the spine into a fully extended position from neck to lower back. And pause briefly at the end range of motion. During the exhale perform a spine flexion (cat pose) articulating the spine into a fully flexed position from neck to lower back. Again, pause briefly at the end range of motion. You can continue to cycle the movement with the breathing or pause for a breath cycle in the neutral position before performing the drill again.

Repeat the drill on the other side by returning to the starting quadruped position, then step the opposite foot up beside the down hand and repeat the breathing and flexion/extension drill.

BRETTZEL 2.0 ON ELBOWS

Begin in a side-sit position where the hip and knee of the front leg are bent at 90 degrees and the rear leg is positioned so the hip is in a straight line with the body and the knee is bent at 90 degrees. Place the same-side elbow on the ground in-line with the hips/pelvis and begin to rotate the thoracic spine in the direction of the thigh of the front leg. The goal is to place the shoulders on a parallel line with the front thigh with both elbows on the ground. Inhale in the starting position and then during the exhale rotate the shoulders toward the ground trying to get the inside elbow to the ground then continue to use your inhale (which may bring you slightly out of the rotation) and exhale (which should allow you to turn further into the rotation) to get as close as possible to a parallel position of the shoulders to the front thigh. Do not push into pain and this should not be felt as a lower back stretch.

QUADRUPED T-SPINE LUMBAR LOCKED RESISTED

Get into a quadruped position and sit the buttocks on the heels with the elbows directly under the shoulder and forearms placed together in the center of the body firmly in the floor. Place one hand on your low back, palm facing away from the back. An FMT band is placed around the shoulder of the arm and behind the back so it is across the chest running toward an attachment point to the side and 45 degrees down from the shoulder. Then, look toward and rotate that shoulder toward the ceiling. The FMT band will resist the turn up into the t-spine rotation. Inhale at the starting position and exhale during the rotation. A pause can be performed at the end range of motion and multiple breath cycles can be performed before returning to the starting position. Return to the starting position and proceed to take the shoulder toward the floor. Keep the post arm firm.

Repeat for the desired number of repetitions/breaths and move the FMT band to the opposite shoulder and repeat on the other side/direction.

Kneeling FRC - Demonstrate

Begin in the Tall kneeling posture by placing both knees on the ground just wider than your hips, your lower legs remain parallel, and your ankles are plantar flexed. Your pelvis remains in a neutral stacked position with a tall spine, and your shoulder and hips remain squared off.

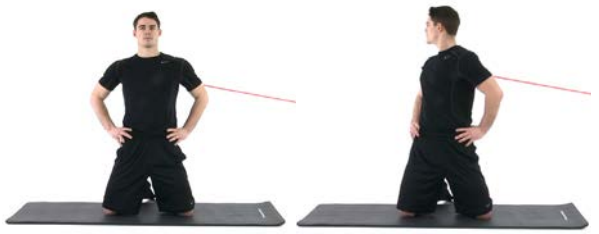
1. Take a normal nasal inhalation and exhalation.
2. At the end of the exhalation the client will take one hand up to the nose and pinch the nose closed and pause or breath hold until the first sign of muscular action and desire to breathe. This is not a maximum breath hold but the functional residual capacity.
3. Record the time

Begin in the Half Kneeling posture by placing one knee on the ground with the shin pointed straight back and the foot turned slightly in. Place the other knee up so the shin is vertical with the foot flat. There should be a straight line from the ear down to the knee and a neutral pelvis.

1. Take a normal nasal inhalation and exhalation.
2. At the end of the exhalation the client will take one hand up to the nose and pinch the nose closed and pause or breath hold until the first sign of muscular action and desire to breathe. This is not a maximum breath hold but the functional residual capacity.
3. Record the time

Stacked Spine - Facilitate

TALL KNEELING TURNS ASSISTED



Being in the Tall kneeling posture by placing both knees on the ground just wider than your hips, your lower legs remain parallel, and your ankles are plantar flexed. Your pelvis remains in a neutral stacked position with a tall spine, and your shoulder and hips remain squared off.

An FMT band is placed around one shoulder and behind/across the back to an attachment point lateral to the individual's stance. This will assist the rotation in the direction of the attachment point but resist rotation in the direction toward the attachment point. Be sure to maintain the balanced upright posture and perform a series of turns:

Head Turns with Stationary KB

Lead with the eyes and turn the head to the right and left in a smooth, controlled manner maintaining the "perfect posture" and take a deep diaphragmatic breath and return to a neutral position. Begin with small turns and slowly add range, but do not push into discomfort or increase the range so that you do not have to compensate in any way. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Head and Shoulder Turns with Moving KB

Lead with the eyes and turn the head and shoulders to the direction of assistance from the FMT band in a smooth and controlled manner maintaining the "perfect posture." Begin with small turns and slowly add range but do not push into discomfort or increase the range, so that you do not have to compensate in any way. Pause at the end ranges to cycle a full breath. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles (turns can also be performed in the direction of resistance as well).

Stacked Spine - Facilitate

HALF KNEELING TURNS ASSISTED

Begin in a half kneeling posture by placing one knee down directly under the hip and the other foot should be in line with the knee, this will create the 90/90 position. Depending on the individual, the width of the front foot can be adjusted for balance. The narrower the foot is in relation to the knee, the greater the challenge. The front foot should feel as light as possible, enough to be able to pick it up and put it down. Throughout the exercises concentrate on staying as tall as possible creating a straight line from the ear, shoulder, hip, and down knee for proper posture alignment.

While in the Half kneeling posture an FMT band is placed around the shoulder of the , across the back to the attachment point to the side of the individual. This will facilitate the turn if turning away from the attachment point and resist the turn if turning toward the attachment point. Be sure to maintain the upright balanced posture and perform a series of turns:

Head Turns with Stationary KB

Lead with the eyes and turn the head to the right and left in a smooth controlled manner maintaining the "perfect posture". Begin with small turns and slowly add range but do not push into discomfort or increase the range so you have to compensate in any way. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Head and Shoulder Turns with Moving KB

Lead with the eyes and turn the head and shoulders to the right and left in a smooth and controlled manner maintaining the "perfect posture". Begin with small turns and slowly add range but do not push into discomfort or increase the range so you have to compensate in any way. Pause at the end range to cycle a full breath. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Stacked Spine - Challenge

TALL KNEELING TURNS LOADED

Begin in the Tall kneeling posture by placing both knees on the ground just wider than your hips, your lower legs should angle inwrads so that the toes of each foot are touching. Your pelvis remains in a neutral stacked position with a tall spine, and your shoulder and hips remain squared off.

Begin by holding either one kettlebell behind your back with both hands or by holding two kettlebells in both hands to the sides of you. Be sure to maintain the balanced upright posture and perform a series of turns:

Head Turns with Stationary KB

Lead with the eyes and turn the head to the right and left in a smooth, controlled manner maintaining the "perfect posture" and take a deep diaphragmatic breath and return to a neutral position. Begin with small turns and slowly add range but do not push into discomfort or increase the range, so you have to compensate in any way. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Head and Shoulder Turns with Moving KB

Lead with the eyes and turn the head and shoulders to the right and left in a smooth and controlled manner maintaining the "perfect posture" and leaving the KB in front of the body. Begin with small turns and slowly add range but do not push into discomfort or increase the range, so you have to compensate in any way. Pause at the end ranges to cycle a full breath. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Stacked Spine - Challenge

HALF KNEELING TURNS LOADED

Begin in a half kneeling posture by placing one knee down directly under the hip and the other foot should be in line with the knee, this will create the 90/90 position. Depending on the individual, the width of the front foot can be adjusted for balance. The narrower the foot is in relation to the knee, the greater the challenge. The front foot should feel as light as possible, enough to be able to pick it up and put it down. Throughout the exercises concentrate on staying as tall as possible creating a straight line from the ear, shoulder, hip, and down knee for proper posture alignment.

While in the Half kneeling posture begin by holding one kettlebell behind the back in both hands or holding two kettlebells in both hands at the sides of you. Be sure to maintain the upright balanced posture and perform a series of turns:

Head Turns with Stationary KB

Lead with the eyes and turn the head to the right and left in a smooth controlled manner maintaining the "perfect posture". Begin with small turns and slowly add range but do not push into discomfort or increase the range so that you do not have to compensate in any way. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Head and Shoulder Turns with Moving KB

Lead with the eyes and turn the head and shoulders to the right and left in a smooth and controlled manner maintaining the "perfect posture" and leaving the KB in front of the body. Begin with small turns and slowly add range but do not push into discomfort or increase the range so that you do not have to compensate in any way. Pause at the end range to cycle a full breath. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Standing FRC - Demonstrate

While Standing:

1. Take a normal nasal inhalation and exhalation.
2. At the end of the exhalation the client will take one hand up to the nose and pinch the nose closed and pause or breath hold until the first sign of muscular action and desire to breathe. This is not a maximum breath hold but the functional residual capacity.
3. Record the time

Standing - Facilitate

TOE TOUCH PROGRESSION

The toe touch progression is a simple exercise to improve body awareness (or sensory awareness) for deep squatting and hip hinging. The toe touch progression is a fundamental component of the exercises needed for the deep squat. It simply teaches the relaxation of the tension in the lower back and how to shift weight from the heels to the toes in a smooth and consistent fashion.

1. Stand erect with the feet side by side, heels and toes touching. The balls of both feet should be elevated onto a 1 to 2-inch platforms such as a board or free weight plate.
2. Insert a towel roll or foam roll between the knees by flexing the knees slightly and separating them without changing foot position. The towel or foam roll should be thick enough that the knees cannot be locked backward or hyper-extended. This position will feel bowlegged and extremely awkward, but do not change it. If foot position is altered in any way, the towel roll is too large; unroll a layer or two before continuing.
3. Reach for the ceiling, stretching the arms as high as possible with palms facing forward. This should not alter breathing. If it does, continue practicing the movement until it can be done without significantly changing breathing.
4. Bend forward so that the fingertips touch the toes. If the fingertips do not make it completely to the toe squeeze the towel roll slightly to help relax certain muscles in the outer thigh and back so that the toes can be reached. If you still cannot reach the toes, bend the knees slightly to reach them for the first repetition.
5. Return to the starting position, keeping the heels on the ground and the hands raised as high as possible overhead with palms facing forward. If a slight knee bend was required for the first repetition, try to bend the knees a little less this time. Reduce the knee bend with each repetition and try to go a little farther each time. You will feel the tension in the calf behind the knee, in the hamstrings and possibly in the lower back.
6. Phase two of the toe touch progression uses the same movement but from a different position. For phase two, elevate the heels on a 1 to 2-inch platform. The toes should be on the ground.
7. Insert the towel roll between the knees without changing the foot position. Repeat the toe touch movement reaching to the toes. There may be slightly greater tension in the lower back and hamstrings and slightly less tension in the calves than in phase one.
8. Bend the knees as little as possible to allow a toe touch and bend the knees less and less with each repetition until they can be held in a nearly straight position. At no time during the exercise should the knee hyperextend or the foot position change. You should be closer to touching your toes or doing so more comfortably following this drill.
9. During the extension (reach up) inhale and during the flexion (toe touch) exhale.

STANDING - Challenge

STANDING TURNS (LOADED BREATHING)

While in a standing position begin by holding a kettlebell or sandbag in both hands behind you, with one kettlebell or sandbag held to one side, or with a kettlebell or sandbag in each hand on each side. Be sure to maintain the balanced upright posture and perform a series of turns:

Head Turns with Stationary KB

Turn the head to the right and left in a smooth controlled manner maintaining the "perfect posture". Begin with small turns and slowly add range but do not push into discomfort or increase the range so that you do not have to compensate in any way. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

Head and Shoulder Turns with Moving KB

Turn the head and shoulders to the right and left in a smooth and controlled manner maintaining the "perfect posture" and leaving the KB in front of the body. Begin with small turns and slowly add range but do not push into discomfort or increase the range so that you do not have to compensate in any way. Pause at the end range to cycle a full breath. If you reach a point where a full breath cannot be achieved, back out of the turn until you can achieve a full breath. Perform a few breath cycles there and then return to the point in the rotation where a full breath could not be achieved and see if it is now possible to cycle a full breath. If so, stay there and complete a few breath cycles.

References

Dysfunctional Breathing

1. *Courtney, R., Dysfunctional Breathing: Its Parameters, Measurement and Relevance, in School of Health Sciences. PhD Thesis 2011, RMIT: Melbourne.*

Link to download Dr. Courtney's PhD Thesis
http://www.breathandbody.com.au/dr-courtneys-phd-thesis/

2. *Courtney, R., K. Greenwood, and M. Cohen, Relationships between measures of dysfunctional breathing in a population with concerns about their breathing. Journal of Bodywork and Movement Therapies, 2011. 15(1): p. 24-34.*

Abstract:

Background: Dysfunctional breathing (DB) is implicated in physical and psychological health, however evaluation is hampered by lack of rigorous definition and clearly defined measures. Screening tools for DB include biochemical measures such as end-tidal CO2, biomechanical measures such assessments of breathing pattern, breathing symptom questionnaires and tests of breathing function such as breath holding time.

Aim:

This study investigates whether screening tools for dysfunctional breathing measure distinct or associated aspects of breathing functionality.

Method:

84 self-referred or practitioner-referred individuals with concerns about their breathing were assessed using screening tools proposed to identify DB. Correlations between these measures were determined.

Results:

Significant correlations where found within categories of measures however correlations between variables in different categories were generally not significant. No measures were found to correlate with carbon dioxide levels.

Conclusion: DB cannot be simply defined. For practical purposes DB is probably best characterized as a multidimensional construct with at least 3 dimensions, biochemical, biomechanical and breathing symptoms. Comprehensive evaluation of breathing dysfunction should include measures of breathing symptoms, breathing pattern, resting CO2 and also include functional measures such a breath holding time and response of breathing to physical and psychological challenges

Functions and dysfunctions of breathing and their relationship to breathing therapy.

Courtney, R., Functions and dysfunctions of breathing and their relationship to breathing therapy. International Journal of Osteopathic Medicine, 2009. 12: p. 78-85.

Abstract

Breathing is unquestionably a key function of the human body; it sustains life by providing oxygen needed for metabolism and removing the by-product of these reactions, carbon dioxide. Breathing, however, has other functions apart from the ventilation of air and the maintenance of oxygen and carbon dioxide. Breathing affects motor control and postural stability and plays several roles in physiological and psychological regulation. Breathing can influence homeostatic functions in other system including the autonomic nervous system, the circulatory system, chemical regulation and metabolism. Breathing becomes dysfunctional when the person is unable to breathe efficiently or when breathing is inappropriate, unhelpful or inefficient in responding to environmental conditions and the changing needs of the individual. Impairment of the functions of breathing affects people's lives, challenging homeostasis, creating symptoms and compromising health. The efficiency with which breathing fulfills its various functions can be diminished because of musculo-skeletal dysfunction, disease, chronic psychological stress or other factors that affect respiratory drive and respiratory control. The neurological control of breathing shows high levels of neuroplasticity as shown by its ability to adapt to a wide range of internal and external conditions. Breathing therapy generally aims to either correct dysfunctions of breathing or enhance its functions. Breathing, unlike most physiological functions, can be controlled voluntarily and it can serve as an entry point for physiological and psychological regulation.

A Multi-Dimensional Model of Dysfunctional Breathing and Integrative Breathing Therapy

Courtney, R., A Multi-Dimensional Model of Dysfunctional Breathing and Integrative Breathing Therapy - Commentary on The functions of Breathing and Its Dysfunctions and Their Relationship to Breathing Therapy. J Yoga Phys Ther 2016. 6(257).

Abstract

Dysfunctional breathing can be defined as breathing that does not fulfill its primary or secondary functions. It is not efficient, adaptive or appropriate for the changing needs of the individual. Dysfunctional breathing has 3 key dimensions biochemical, biomechanical and psychophysiological. This article discusses this multi-dimensional model of dysfunctional breathing, describes its evolution and application in a clinical setting. The article titled functions of breathing and its dysfunctions and their relationship to breathing therapy explores biomechanical, physiological and psychological aspects of breathing. It discusses the characteristics of neuromuscular, biochemical and psychophysiological dysfunctions of breathing, identifies common causes of these and describes the impact that dysfunctional breathing has on posture and motor control, hemodynamics, function of the lymphatic system, physiological regulation and the autonomic nervous system. It also briefly reviews some of the research on using breathing as therapy. In this commentary I will expand on the on the multi-dimensional model of dysfunctional breathing that underpins this article, describe the evolution of this model and discuss the practical application of this model in a clinical setting.

Link to download this open-access article

https://www.omicsonline.org/open-access/a-multidimensional-model-of-dysfunctional-breathing-and-integrativebreathing-therapy--commentary-on-the-functions-of-breathing-and-2157-7595-1000257.php?aid=82044

Breathing Screen

Development of a Screen to Identify Individuals with Dysfunctional Breathing.

Kiesel KB, Rhodes TN, Mueller JR, Waninger AR, Butler RJ. Development of a Screen to Identify Individuals with Dysfunctional Breathing. Poster presented at: 9th World Congress of Low Back and Pelvic Pain 2016; Singapore.

Abstract

Dysfunctional breathing (DB) has been linked to conditions including low back pain and neck pain and adversely effects the musculoskeletal system. Individuals with DB have decreased pain thresholds and impaired motor control, balance, and movement. No single test or screen identifies DB, which is multi-dimensional and includes biochemical, biomechanical, and breathing symptoms. Several tools assess and test for DB, but no screen exists to determine if testing and assessment are indicated.

Purpose/Background

This study explored factors linked to DB that could be used to develop a breathing screen for fitness and health care providers.

Methods

A convenience sample of 51 subjects (27 females, 27.0 years, BMI 23.3) were included. Breathing was measured with capnography for the biochemical dimension, (ETCO2), the HI-LO test for biomechanical dimension, and questionnaires for breathing symptoms. Potential screening items included measures that could be performed by non-health care personnel including activity level, breath hold time (BHT), respiration rate, and the Functional Movement Screen.

Results/Discussion:

There were no strong correlations between the 3 measures of DB. Five subjects had normal breathing, 14 failed at least 1 measure, 20 failed at least 2, and 12 failed all 3. To develop screening items for each dimension, data were examined for association with failure. BHT and a 4 item mini-questionnaire were identified as the most closely associated variables with failure of all three dimensions. A BHT of <25 seconds and 4 questions were combined and yielded a sensitivity of 0.89 (.85-.93) and a specificity of 0.38 (.11-.58) to identify DB.

Conclusion:

Easily obtained clinical measures of BHT and 4 questions can be utilized to screen for the presences of DB. If the screen is passed there is a 89% chance that DB is not present. If the screen is failed, further assessment is recommended.

SEBQ

Preliminary Investigation of a measure of dysfunctional breathing symptoms

Courtney, R. and K.M. Greenwood, Preliminary Investigation of a measure of dysfunctional breathing symptoms: the Self Evaluation of Breathing Questionnaire (SEBQ). International Journal of Osteopathic Medicine, 2009. 12: p. 121-127.

Abstract

Dysfunctional breathing (DB) can be defined by the presence of unexplained breathing symptoms. However, validated questionnaires to comprehensively evaluate all dimensions of breathing symptoms proposed to be associated with DB have not been extensively developed. This paper discusses the development and exploration of the dimensionality of a preliminary questionnaire, the Self Evaluation of Breathing Questionnaire, whose items were derived from a popular Internet questionnaire for evaluating breathing functionality and breathing symptoms proposed in the scientific literature to be discriminative for DB. Method: The 17-item SEBQ was administered to 83 adults. Exploratory factoranalysis was performed and correlations calculated between the SEBQ and the Nijmegen Questionnaire (NQ), which is a validated questionnaire for hyperventilation syndrome.

Results/Discussion:

Two dimensions were found in the SEBQ. One dimension named "lack of air" appears to reflect sensations of air hunger that may relate more to chemoreceptor aspects of breathing sensation. The other dimension named "perception of inappropriate or restricted breathing" appears to reflect sensations and observations about the work of breathing and may relate more to the biomechanical aspects of breathing sensation. The correlations between the SEBQ and the NQ were .6 for the 17-item SEBQ and .3 for the final 12-item SEBQ which contained the strongest items of the two dimensions.

Conclusion:

Breathing symptoms associated with dysfunctional breathing arising from predominately biomechanical aspects of breathing might be distinguishable from symptoms arising from factors reflecting chemoreceptor input. The two dimensions of the SEBQ may represent related but distinct aspects of dysfunctional breathing symptoms that appear different to those assessed by the Nijmegen Questionnaire. The SEBQ, if further developed, may be a useful clinical assessment tool that could more discriminatively evaluate the response of separate dimensions of breathing symptoms to treatments that aim to improve the functionality of breathing.

MARM

Evaluation of Breathing Pattern: Comparison of a manual assessment of respiratory motion (MARM) and respiratory induction plethysmography.

Courtney, R., J. van Dixhoorn, and M. Cohen, Evaluation of Breathing Pattern: Comparison of a manual assessment of respiratory motion (MARM) and respiratory induction plethysmography. Applied Psychophysiology and Biofeedback, 2008. 33: p. 91-100.

Abstract

Altered breathing pattern is an aspect of dysfunctional breathing but few standardized techniques exist to evaluate it. This study investigates a technique for evaluating and quantifying breathing pattern, called the Manual Assessment of Respiratory Motion (MARM) and compares it to measures performed with Respiratory Induction Plethysmography (RIP).12 Subjects altered their breathing and posture while 2 examiners assessed their breathing using the MARM. Simultaneous measurements with RIP were taken. Inter-examiner agreement and agreement between MARM and RIP were assessed. The ability of the measurement methods to differentiate between diverse breathing and postural patterns was compared. High levels of agreement between examiners were found with the MARM for measures of the upper rib cage relative to lower rib cage/abdomen motion during breathing but not for measures of volume. The measures of upper rib cage dominance during breathing correlated with similar measures obtained from RIP. Both RIP and MARM measures methods were able to differentiate between abdominal and thoracic breathing patterns, but only MARM was able to differentiate between breathing changes occurring as result of slumped versus erect sitting posture. This study suggests that the MARM is a reliable clinical tool for assessing breathing pattern.

MARM

Comparison of the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment in determining a simulated breathing pattern.

Courtney, R. and J. Reece, Comparison of the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment in determining a simulated breathing pattern. International Journal of Osteopathic Medicine, 2009. 12: p. 86-91.

Abstract

The aim of this study was to assess and compare the validity and potential utility of two manual breathing assessment procedures: the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment. A secondary aim was to gauge the relationships between experience and the ability to perform these assessment techniques, by comparing the performance of students with practitioners.

Method:

56 osteopaths and osteopathic students were taught the MARM and the Hi Lo Breathing Assessment and trained to simulate breathing patterns. The participants, acting alternativelyas breathers and examiners, then attempted to accurately determine whether the breathing patterns simulated by their partner were predominately abdominal, thoracic or, in the case of the Hi Lo, paradoxical. Participants were surveyed on their confidence in the use of each technique, their perceived ease in using each technique, and their intended future use of the techniques. Student and practitioner abilities to detect simulated breathing patterns were compared for the MARM and Hi Lo.

Results:

Overall scores for correctly determining breathing patterns were not significantly different for the MARM or the Hi Lo, and there was no notable moderation of this effect according to experience, with both practitioners and students demonstrating a high level of performance on both techniques. There were some differences in accuracy of performance across different breathing styles, with Hi Lo assessment of paradoxical breathing being more dif cult to identify correctly. Ease of learning was similar for MARM and Hi Lo but confidence in using the techniques, and intended future use was higher for the MARM. There were some significant relationships between these utility measures and performance, particularly on the MARM.

Conclusions:

This study builds on our previous study to strengthen the evidence for the validity of the MARM and also supports the validity of the Hi Lo. Responses to the survey indicate that, overall, participants preferred the MARM to the Hi Lo. This study is a preliminary investigation of these techniques. Future studies to test the validity of these techniques should be performed in a clinical setting on individuals with actual rather than simulated breathing pattern disturbances.

Breath Holding Time

The Relationship of Breath Holding Time to End Tidal CO2 and other Proposed Measures of Dysfunctional Breathing.

Courtney, R. and M. Cohen, Investigating the Claims of Konstantin Buteyko M.D., PhD: The Relationship of Breath Holding Time to End Tidal CO2 and other Proposed Measures of Dysfunctional Breathing. Journal of Alternative and Complementary Medicine, 2008. 14(2): p. 115-123.

Abstract

Konstantin Buteyko, M.D., Ph.D., claimed that breath holding time (BHT) can be used to detect chronic hyperventilation and that BHT predicts alveolar CO2 (PaCO2) according to his patented mathematical formula. The Buteyko Breathing Technique (BBT) is believed to correct chronic hyperventilation as evidenced by increased BHT. In this study, we test Buteyko's claims and explore the relationship between BHT and end-tidal carbon dioxide (ETCO2) as well as measures of dysfunctional breathing (DB) including the Nijmegen questionnaire, the Self Evaluation of Breathing Questionnaire, and thoracic dominant breathing pattern.

Method:

Eighty-three (83) adults healthy or suspected of having dysfunctional breathing, 29 with abnormal spirometry readings, 54 with normal spirometry. Outcome measures: BHT, performed according to BBT protocols, was measured along with ETCO2 and other measures of DB including the Nijmegen questionnaire, and manual assessment of respiratory motion, a palpatory technique for measuring thoraco-abdominal balance during breathing. Correlations between measures of DB were made in the whole sample and also in subgroups with normal or abnormal spirometry. DB measures were compared in normal and abnormal spirometry groups.

Results:

The results revealed a negative correlation between BHT and ETCO2 (r 0.241, p 0.05), directly opposite to Buteyko's claims. BHT was significantly shorter in people with abnormal spirometry (FEV1 or FVC 15% below predicted), with no difference in ETCO2 levels between the abnormal and normal spirometry groups. In the abnormal spirometry group, lower BHT was found to correlate with a thoracic dominant breathing pattern. (r 0.408, p 0.028).

Conclusions:

Although BHT does not predict resting ETCO2, it does correlate with breathing pattern in subjects with abnormal spirometry. It is proposed that altered breathing pattern could contribute to breathing symptoms such as dyspnea and that breathing therapies such as BBT might influence symptoms by improving the efficiency of the biomechanics of breathing.

Breath Holding Time

Behavioral infuences and physiological indices of ventilatory control in subjects with idiopathic hyperventilation.

Jack, S., et al., Behavioral influences and physiological induces of ventilatory control in subjects with idiopathic hyperventilation. Behavioral Modification, 2003. 27(5): p. 637-52d .

1Nishino, T., Pathophysiolgy of dyspnea evaluated by breath-holding test: studies of furosemide treatment. Respiratory Physiology and Neurobiology, 2009. 167: p. 20-25. [11-13]

Abstract

Idiopathic hyperventilation has been defined as a respiratory-related psychophysiological complaint. This study attempted to clarify relationships between psychological and physiological variables in this condition. Participants demonstrated increased anxiety, depression, and symptoms consistent with hyperventilation. This was associated with a reduced peripheral chemosensitivity (isocapnic hypoxic re-breathe; –0.84 0.5 min–1 %O 2 –1), which was normalized with experimentally increased pCO2. Resting CO2 sensitivity was close to normal (2.1 1.0 min–1 mmHg–1).Breath hold time was significantly reduced versus controls(20.4s 12svs.63s 31s), andrestingPETCO2wascorrelatedwiththeanxietyscore.Also,the ventilatory response to moderate intensity exercise was augmented (vs. controls). The normalcy of pulmonary and chemoreceptor responses suggests that psychological factors may initiate this hyperventilation, which may become a conditioned response with an increased drive to breathe.

Nijmegen Questionnaire

Efficacy of the Nijmegen questionnaire in recognition of the hyperventilation syndrome

Dixhoorn, J. and H. Duivenvoorden, Efficacy of the Nijmegen questionnaire in recognition of the hyperventilation syndrome. Journal of Psychsomatic Research, 1985. 29(2): p. 199-205.

Abstract

The pattern of complaints of patients with the hyperventilation syndrome (HVS) was studied on the basis of the Nijmegen HVS Questionnaire (van Doorn, Colla, Folgering). This list was completed by 75 patients with the clinical diagnosis HVS. Non-metric principal components analysis (NMPCA) showed that the structure was three-dimensional, the dimensions being labeled: Shortness of breath (HVS-1), Peripheral tetany (HVS-II), Central tetany (HVS-III). The questionnaire's differentiating ability was investigated by comparing HVS patients with non-HVS persons (80 persons employed in health care). All three components had an unequivocally high ability to differentiate between HVS and non-HVS. Application of linear analysis of discriminance to HVS-I, HVS-II and HVS-III together yielded 93% correct classifications. Statistical double cross-validation resulted in 90 and 94% correct classifications. The sensitivity of the Nijmegen Questionnaire in relation to the clinical diagnosis was 91% and the specificity 95%. It is concluded that the questionnaire is suitable as a screening instrument for early detection of HVS, and also as an aid in diagnosis and therapy planning.

The Nijmegen Questionnaire and dysfunctional breathing.

van Dixhoorn, J. and H. Folgering, The Nijmegen Questionnaire and dysfunctional breathing. ERJ Open Res, 2015. 1(1).

Link to open access article
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5005127/

MARM

Comparison of the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment in determining a simulated breathing pattern.

Courtney, R. and J. Reece, Comparison of the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment in determining a simulated breathing pattern. International Journal of Osteopathic Medicine, 2009. 12: p. 86-91.

Abstract

The aim of this study was to assess and compare the validity and potential utility of two manual breathing assessment procedures: the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment. A secondary aim was to gauge the relationships between experience and the ability to perform these assessment techniques, by comparing the performance of students with practitioners.

Method:

56 osteopaths and osteopathic students were taught the MARM and the Hi Lo Breathing Assessment and trained to simulate breathing patterns. The participants, acting alternativelyas breathers and examiners, then attempted to accurately determine whether the breathing patterns simulated by their partner were predominately abdominal, thoracic or, in the case of the Hi Lo, paradoxical. Participants were surveyed on their confidence in the use of each technique, their perceived ease in using each technique, and their intended future use of the techniques. Student and practitioner abilities to detect simulated breathing patterns were compared for the MARM and Hi Lo.

Results:

Overall scores for correctly determining breathing patterns were not significantly different for the MARM or the Hi Lo, and there was no notable moderation of this effect according to experience, with both practitioners and students demonstrating a high level of performance on both techniques. There were some differences in accuracy of performance across different breathing styles, with Hi Lo assessment of paradoxical breathing being more difficult to identify correctly. Ease of learning was similar for MARM and Hi Lo but confidence in using the techniques, and intended future use was higher for the MARM. There were some significant relationships between these utility measures and performance, particularly on the MARM.

Conclusions:

This study builds on our previous study to strengthen the evidence for the validity of the MARM and also supports the validity of the Hi Lo. Responses to the survey indicate that, overall, participants preferred the MARM to the Hi Lo. This study is a preliminary investigation of these techniques. Future studies to test the validity of these techniques should be performed in a clinical setting on individuals with actual rather than simulated breathing pattern disturbances.