

Beyond “Belly Breathing”:
A Multidimensional Approach to
Breathing Dysfunction

Combined Sections Meeting 2019
Washington, DC, January 23-26, 2019

Dr. Kyle Kiesel, PT, PhD
University of Evansville
Evansville, IN

Dr. Alyssa Englert, PT, DPT, SCS
ProRehab, PC
Evansville, IN

Disclosure

Dr. Kiesel is an equity partner in Functional Movement Systems which has developed a home study course on breathing dysfunction.

Objectives

After completion of this course, the learner will:

1. Recognize the prevalence of breathing dysfunction and its adverse effect on the musculoskeletal system.
2. Differentiate between the multiple dimensions of dysfunctional breathing.
3. Apply and interpret the breathing screen.
4. Apply suggested therapeutic exercises to correct dysfunctional breathing.

Introduction to
Multidimensional Nature of
Breathing Dysfunction

3 Dimensions of Breathing Dysfunction

1. Biochemical
2. Biomechanical
3. Psychophysiological

Development of the
Breathing Screen

Initial Research:
Development of the Screen

N = 51

Measurement of the 3 Dimensions

- Biochemical
Capnography (ETCO2) <35mmHG
- Biomechanical
HI-LO test + **upper chest dominant or paradoxical**
- Breathing Symptoms
SEBQ questionnaire >25
Nijmegen questionnaire >22

Breath Hold Time

Breath Hold Time (at Functional Residual Capacity)

AKA “controlled pause”

Results

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 (0.85-0.93)** and a specificity of 0.60 (0.18-0.92) to identify DB.

Sn = 0.89

Kiesel KB, Rhodes T, Mueller J, Englert AR, Butler RJ. Development Of A Screening Protocol To Identify Individuals With Dysfunctional Breathing. *International journal of sports physical therapy*. 2017;12(5):774-86.

Validation Study

N = 61

Subjects

N = 61	29 male, 32 female
Age	25.8 (8.1)
BMI	24.3 (4.0)

23 subjects demonstrated normal breathing

15 individuals failed at least 1 measure
19 individuals failed at least 2
4 individuals failed all 3

Prevalence of DB = 63%

Results

The **sensitivity** of the screen to identify subjects with any DB was **0.82** (0.73-0.90). The specificity of the screen was 0.26 (0.12-0.40).

Sn = 0.82

Kiesel KB, Blair L, Brown E, Kocher J, Sizemore S, Thornton R, Rhodes T, Englert A, Butler RJ. Validation Of A Screen For Dysfunctional Breathing. Poster presented at: APTA Combined Sections Meeting 2018; New Orleans, LA.

Breathing Screen

Breathing Screen

- Breath Hold Time at FRC
- Mini 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 and do not load this group with resistance

Yellow – proceed with caution – add breathing retraining to activity

Green – Go – breathing is optimal and individual likely moves well

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

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

Breathing Screen Lab

Breathing Assessment
Demonstration

Breathing Assessment

- Hi Lo
- Ribcage Glides
- Thorax Mobility

MARM

Breathing Retraining Research
and Exercise Demonstration

Intervention Study

Subjects

Experimental Group

Enrolled 25
5 dropped out
4 did not meet inclusion criteria
N = 16

Matched Control Group

Enrolled 26
1 subject dropped due to illness on post testing date
6 subjects passed the breathing screen so were dropped
N = 19

Results

Improved at least one category

Exp: 13/16 = 81 %

Con: 4/19 = 21%

NNT = 1.66 (1.19-4.5) 2 (2-5)

Results

Biomechanical dysfunction normalized

Exp: 11/14 = 78%

Con: 0/17

NNT = 1.32 (1.21-2.61). 2 (2-3)

Results

Biochemical dysfunction normalized

Exp: 3/11 = 27%

Con: 2/8 = 25%

NNT = 44 (2.4-INF)

Results

Psychophysiological dysfunction normalized

Exp: 1/2 = 50%

Con: 2/2 = 100%

Exercises – Week 1 and 2

Crocodile Breathing Side Lying



Exercises – Week 1 and 2

Hooklying Breathing



Exercises – Week 1 and 2

Rib Grab with Thoracic Rotation



Exercises – Week 1 and 2

Quadruped Foot to Hand with Flexion/Extension



Exercises – Week 3 and 4

Quadruped Foot to Hand with Flexion/Extension



Exercises – Week 3 and 4

Kneeling Turns



Exercises – Week 3 and 4

Toe Touch Progression



Question and Answer

References

1. Bradley, H., and J. Esformes. 2014. “Breathing Pattern Disorders and Functional Movement.” *International Journal of Sports Physical Therapy* 9 (1): 28–39.
2. Courtney, R., J. van Dixhoorn, K. M. Greenwood, and E. L. Anthonissen. 2011. “Medically Unexplained Dyspnea: Partly Moderated by Dysfunctional (thoracic Dominant) Breathing Pattern.” *The Journal of Asthma: Official Journal of the Association for the Care of Asthma* 48 (3): 259–65.
3. Courtney, R., K. M. Greenwood, and M. Cohen. 2011. “Relationships between Measures of Dysfunctional Breathing in a Population with Concerns about Their Breathing.” *Journal of Bodywork and Movement Therapies* 15 (1): 24–34.
4. Kiesel, K. B., T. N. Rhodes, J. R. Mueller, A. R. Waninger, and R. J. Butler. 2017. “Development of a Screen to Identify Individuals with Dysfunctional Breathing.” *International Journal of Sports Physical Therapy* 12 (5): 774–84.
5. Kiesel KB, Blair L, Brown E, Kocher J, Sizemore S, Thornton R, Rhodes T, Englert A, Butler RJ. Validation of A Screen For Dysfunctional Breathing. Poster presented at: APTA Combined Sections Meeting 2018; New Orleans, LA.
6. Kolar, P., J. Sulc, M. Kyncl, J. Sanda, O. Cakrt, R. Andel, K. Kumagai, and A. Kobesova. 2012. “Postural Function of the Diaphragm in Persons with and without Chronic Low Back Pain.” *The Journal of Orthopaedic and Sports Physical Therapy* 42 (4): 352–62.
