BREATHING+

Pursed Lip Breathing

Respiratory Training Device

Abstract

Pursed Lip Breathing (PLB) is a breathing exercise in which a patient is encouraged to exhale through pursed lips in order to open the airways and exhale more air from the body. [1][2][3] BREATHING+ is a device which uses such an exhalation to interact with “breathing games” and “breathing apps” to improve compliance of and adherence to PLB exercise. Breathing games and apps are designed to promote user to make exhalations longer.

Indications

- Asthma, COPD
- Post-operative Rehabilitation
- Recovery from illness or injury
- Shortness of breath, breathing difficulty
- Stress and Anxiety
- Attention Deficit Disorder
- Speech Disorders

Contraindications

Under 7 years age

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[1] Thoman, Rex L, GL Stoker, and JC Ross. "The efficacy of pursed-lips breathing in patients with chronic obstructive pulmonary disease." *The American review of respiratory disease* 93.1 (1966): 100.

[2] Nield, Margaret A et al. "Efficacy of pursed-lips breathing: a breathing pattern retraining strategy for dyspnea reduction." *Journal of cardiopulmonary rehabilitation and prevention* 27.4 (2007): 237-244.

[3] Barach, AL. "Physiologic advantages of grunting, groaning, and pursed-lip breathing: adaptive symptoms related to the development of continuous positive pressure breathing." *Bulletin of the New York Academy of Medicine* 49.8 (1973): 666.

Kids under 7 years should use the product in assistance with their parents or caregivers.

Depression

Breathing with longer exhalations triggers the parasympathetic nervous system, the rest-and-digest response. If you suffer from depression, this can further aggravate it as you tend to predominantly activate your parasympathetic; Putting the body in a state of relaxation but increasing a lack of motivation.

Diabetes

If you suffer from diabetes and use insulin or other blood glucose-lowering medication, the pursed lip breathing exercise can increase your sensitivity to medication. This can make your blood glucose level lower than usual. You may suffer then from hypoglycemic shock, which is much more dangerous than high blood sugar. You should have a small snack immediately after the breathing session.

Heart Conditions (relevant to muscle stimulation product only)

If you have any heart conditions or have an implanted pacemaker you are especially susceptible to abnormal heart rhythms from the EMS.

Severe Personality Disorders

Personality disorders, psychopathic disorders, severe forms of depression, mania, obsessive-compulsive disorder and delirium. In these disorders the patient is more likely to interpret a breathing exercise in the context of his/her personality disorder in which the therapist no longer has sufficient control over the therapy's effect.

Skin Conditions

Electrode pads should not be applied on areas of irritated or broken skin as the current flows through the breaks in the skin and causes discomfort.

Late pregnancy (relevant to muscle stimulation product only)

Use of electrical stimulation should be avoided over certain areas during pregnancy, including the abdomen primarily the risk of unwanted uterine contractions. The effects of electrical current on a developing fetus are uncertain.

Psychoactive Substances

Opioids, benzodiazepines and caffeine may decrease the effectiveness of therapy.

Side effects

Dehydration

Practicing pursed lip breathing expels air that was previously trapped in the lungs. This air is saturated with water and CO2 resulting in dehydration. Thus the patient is required to drink some water after the exercise.

Dizziness

In elderly patients a short-term dizziness is possible therefore after exercise the patient should rest for a while.

Dosage

Exercise should be provided at least once daily in the form of ten (10) prolonged exhalations (blows). Exercise should be carried out in a relaxed sitting position. The aim is to achieve longest blow possible.

Warnings

Usage

After exercise patient should drink water to replenish fluids lost.

Maintenance

Before and after use, clean headset with dry tissue.

Storing

Store the headset in a clean and dry environment.

Clinical use

Asthma and COPD

Pursed lip breathing is most often practiced to treat asthma and COPD as it makes breathing more efficient, improves oxygenation and reduces breathing rate[4]. Additionally it is recommended during an asthma attack.[5]

Warning: Supply patients with extra water.

Stress and Anxiety

Pursed lip breathing helps in coping with stress and anxiety related disorders. It can be used as a 10-20 minutes daily systematic respiratory exercise to train breathing in complex with other rehabilitative activities[6].

Warning: Supply patients with extra water.

Pulmonary Rehabilitation

In rehabilitation pursed lip breathing (PLB) should be applied several times thorough the day to avoid pulmonary complications, such as actelectasis, pneumonia, respiratory failure, sputum retention and shortness of breath. PLB technique provides resistance on expiration and aims to improve lung volumes and to facilitate secretion mobilization[78].

Warning: Supply patients with extra water.

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[4] Bott, Julia, and British Thoracic Society Physiotherapy Guideline Development Group. *Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient*. BMJ Publ. Group, 2009.

[5] "Asthma Action Plan - American Lung Association." 2012. 26 Nov. 2014 <http://www.lung.org/associations/states/colorado/asthma/asthma-action-plan.html>

[6] "Principles and Practice of Stress Management, Third Edition ..." 2012. 7 Dec. 2014 <http://www.amazon.com/Principles-Practice-Stress-Management-Edition/dp/160623000X>

[7] American Association of Cardiovascular & Pulmonary Rehabilitation. *Guidelines for pulmonary rehabilitation programs*. Human Kinetics, 2010.

[8] Bott, Julia, and British Thoracic Society Physiotherapy Guideline Development Group. *Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient*. BMJ Publ. Group, 2009.

Functional Rehabilitation

Pursed lip breathing in conjunction with a form of muscle stimulation called electrical muscle stimulation can be used to train abdominal muscles during exhalation for more efficient breathing, muscle toning, losing weight and preventing certain injuries. The exercise can be carried out at least twice daily in a set of 6, breathing out for longer than you breathe in. When using the Electrical Muscle Stimulator, it should be used on patients at 5-10 minute intervals at an appropriate voltage that does not cause discomfort.

Warning: Supply patients with sufficient water. Ensure all the knobs on the device are turned off to prevent electric shock. Electrode patches are meant to be at least 1 inch apart and firmly on skin. Wipe down before use to ensure both that it is clean and that there are no traces of water.

Reports in chronological order

Faculty of Electrical Engineering, Ljubljana, Slovenia

(Preclinical) Robustness and reliability of breathing frequency detection

Principal Investigator: Matevz Leskovsek, contact: +386 31 380 511

Report: "In 2011, we published the results of preclinical studies, where we have observed the functionality of the product Breathing +. We demonstrate a low latency breathing frequency detection that is fast (<5 ms), easy to operate, requires no batteries or external power supply and operates fully via computer-standard USB connection. Exercises in controlling breathing frequency, usually referred to as paced breathing exercises, have shown positive effects in treating pulmonary diseases, cardiovascular diseases and stress/anxiety-related disorders. We developed a breathing frequency detection system which uses two pairs of microphones to detect exhalation activity, eliminate noise from the environment and stream the recording data via USB connection to a personal computer. It showed 97.1% reliability (10 subjects) when monitoring breathing activity in non-guided free breathing and 100% reliability (10 subjects) when monitoring breathing activity during interactive paced-breathing

exercises. We also evaluated the breathing frequency detection systems noise elimination functionality which showed a reduction of 84.2 dB for stationary (white noise) and a reduction of 79.3 dB for nonstationary (hands clapping) noise.

Status: Published.
J Med Eng Technol. 2011 Sep-Oct; 35 (6-7): 322-9
doi: 10.3109 / 03091902.2011.591481
Epub 2011 Jul 18
Link to the full article here:
http://www.ncbi.nlm.nih.gov/pubmed/21767133

Faculty of Sport, Gortanova 22, 1000 Ljubljana, Slovenia

Effect of breathing pattern on memory formation, a study published in the Journal of Neurology, Psychiatry and Brain Research

Principal Investigator: Ajda Skarlovnik, MD., Contact: +386 31 335 533

Report:”In this research, we observe volunteer's ability to recall visual stimuli in relation to their breathing phase at the time of presentation of those stimuli. To assess the ability to recall visual stimuli, we have exposed volunteers to a short term cued visual recall task; a cued Brown–Peterson task. We observe that the ability to recall visual stimuli does not noticeably relate to inspiration/expiration phasing (4.2% bias), but that it more noticeably relates to volume of air in lungs measured as expansion of abdomen (10.2% bias). We propose that this observation could potentially suggest that humans are more susceptible to memorizing new stimuli when there is less air in their lungs; i.e. after they have sufficiently exhaled by sighing, yawning, or vocally expressing what's on their mind. As soon as new inhalation occurs, another fight or flight response is initiated, and their susceptibility to new information is reduced.

Status: Published.

PII: S0941-9500 (13) 00018-3
doi: 10.1016 / j.npbr.2013.07.001
Link to the full article here:
http://www.npbrjournal.com/article/S0941-9500(13)00018-3/abstract

Three weeks breathing retraining of professional athletes

Principal Investigator: Nika Pušenjak, contact: +386 41 604410

Report: "An examiner reported a consistent increase in breathing coherence in all 15 volunteers. Additionally all 15 volunteers reported that breathing exercises helped them reduce pre-competitive anxiety and had probably improved their results at the competition. The fastest progress showed shooters, archers, fencers and wake boarders. Most of the athletes reported that they exercise reduce stage fright before the onset of and improve their results in competitions. We conclude that respiratory training very effectively help athletes improve their performance - increases blood flow, heart rate and uniformity of breathing."

Status: Published.
Link to the full article here:
http://www.biofeedbackvereniging.nl/downloads/Abstractbook2011BFEMunchen.pdf

Hospital Kranj, Kidričeva 38A, Slovenia

Computational respiratory physiotherapy

Principal Investigator: Ivanka Pohar, higher physiotherapist, contact: +386 40 431 754

Report: "Breathing+ significantly increases the motivation of patients to carry out breathing exercises, which brings a better psycho-physical condition and shortens the duration of the recovery." Ivanka Pohar, higher physiotherapist

Status: In progress.

The introduction of computerized PLB exercise in the process of post-operative care

Principal Investigator: Ales Rozman, PhD. med., Contact: +386 4 208 28 00

Report: "PLB (pursed Lip Breathing) is widely practiced in the context of post-operative rehabilitation in this investigation will be patient in carrying out PLB by playing breathing games on a tablet computer. Reducing the collapse of airways leads to an improved oxygenation and it reduces post-operative complications from respiratory (postoperative pneumonia, ...) and enables faster rehabilitation. The purpose of the study is to determine 1) The appropriate dose therapy and exercise time and 2) the inclusion

criteria for the subsequent study of effectiveness (efficacy) and 3) any unwanted effects. "

Status: In progress.

Psychiatric Clinic Temza doo, Ljubljana Dunajska c. 198, Slovenia

Exhalation through pursed lips aids in reducing stress anxiety

Principal Investigator: Dragomira Ahlin, MD, contact: +386 1 569 25 87; +386 40 603 349

Report: "Breathing is a physiological function that can be either voluntary or involuntary. A wide known fact supported by various research shows that breathing is affected by our mental, cognitive, and emotional states and that breathing disregulation plays an important role in anxiety disorders (Wilhelm, Gevirtz, & Roth, 2001). There are many empirical studies covering the application of breathing retraining on anxiety and beyond anxiety management, i.e. hypertension, chronic obstructive pulmonary disease, cardiac rehabilitation (Gilbert, 2003). 45 subjects with anxiety disorder were asked to participate in a 10-minute task in which a computer program would randomly select one graphic image from a wide variety of images representing accidents, phobias, tragedies and stressful situations. The subjects were asked to observe the image on the computer screen and exhale through pursed lips as they would see the image fade away in accordance to their blowing. During inhalation the image was replaced by another one. The subject was instructed to play this game using the computer program for 10 minutes each day for 30 days. The subject’s anxiety was assessed using the Hamilton anxiety scale three times during the experiment (Hamilton 1959); before the first breathing session, after 14 days and after 30 days. We predict a reconditioning of the stress response to an exhaling breathing pattern which increases parasympathetic activity and decreases heart rate. Thus we expect a progressive decrease on the Hamilton anxiety scale as well as a change in breathing patterns in stress inducing situations. We might have some difficulty determining the level of anxiety induced by the images. The set up, being simple as it is, could be a valuable self help tool in breathing regulation for patients with anxiety disorders.

Status: In progress.

"Trial was conducted on four separate days within one month period. Volunteers that participated in the trial were active adults (34 subjects), that were consulting a medical doctor because of a career related burnout or similar stress related disorder and were diagnosed with either anxiety, stress related disorder or career related burnout. Trial was conducted at the psychiatric clinic TEMZA d. o. o. and had been approved by the Medical Ethics Committee of Slovenia (application number 120/02/10) on 24th March 2010. Prior to an experiment volunteers were asked to read and sign an informed consent that appeared at the top of the questionnaire. Personal information was not collected although some volunteers did identify themselves by their full name while some of them signed as anonymous. Volunteers were then asked to follow the instructions on the computer screen. The first instruction showed the following image (Figure 1) and asked volunteers to install the headset [14] accordingly. When clicking "next" volunteers were shown an animation. Volunteers were required to accomplish 50 breathing cycles in order to complete the exercise. Then volunteers were asked to answer six questions by checking a YES/NO checkmark (Table 1). Additionally volunteers were encouraged to provide comments of their own choice.

Objective A)

Comprehensibility of guidance system was evaluated by questions #1 and #2. Its weak points were identified by observing which of those negative answers correlated with negative answers to questions #5 or #6. Additionally user provided comments were screened to identify those expressing comprehensibility issues of proposed technology. Those such comments that correlated with negative answers to questions #5 or #6 were also identified as comprehensibility's weak points.

Objective B)

Adverse events were evaluated by answers to questions #3 and #4. Additionally user provided comments were screened to identify those that expressed unpleasant feelings of any kind, and if found were included as adverse events.

Objective C)

Design flaws that correlate with poor user's experience were assessed by identifying which answers to questions #1, #2, #3, and #4 correlate with negative answers to questions #5 or #6. Additionally all comments that correlate with negative answers to questions #5 or #6 were identified as design flaws.

3. Results

Minimum 7 volunteers and maximum 10 volunteers participated in a trial each day. Each volunteer participated in a trial only once and none of them was withdrawn from the trial. All volunteers answered all the questions in the questionnaire. The results are shown in Table 2.

Weak points of comprehensibility are A1) applying headset (21%) and A2) adhering to breathing exercises instructions (7%). B) No adverse events are identified. C) Design flaws that correlate with poor user's experience are C1) the unpleasant feeling induced by watching the computer screen (21%) and C2) ease/difficulty of physically applying headset (14%). Other devices for breathing exercises require users to force air into device, such as Frolov device (Dinamika LTD, Russia), [15-19] PowerLung (Powerlung inc.) [20], SpiroBall/ThreeBall (Leventon Barcelona1) [21], and Threshold PEEP/IMT (Respironics Healthscan Inc.2). There are some obvious advantages over these methods. Firstly, blowing air into the mouthpiece does not require a physical contact with users' mouth or lips, therefore it provides less possibilities for infection. Secondly using a microphone to assess the user's breathing allows for greatest possible interoperability with other electronic devices that have audio input codex already implemented, such as mobile phones, tablets and portable music players. It thus allows for low cost integration with various computer games and other multimedia content to improve user's experience and improve motivation for conducting breathing exercises. Thirdly using a web browser to conduct breathing exercises allows for best possible supervision of exercise implementation and can be used in various telemedicine applications. Additionally the proposed technology provides one major advantage; user can be eventually taught to implement the exhalation through pursed lips into their daily routine and change their breathing behavior without raising their dependence on technology. Such a behavior can already be observed in humans, for example when a person exhales through pursed lips as a sign of relief. Some devices do not require a user to exhale against pressure, such as Resperate device (Intercure Ltd) [23-27] and so it has less benefits for COPD patients. NOTES: Leventon Barcelona was aquired by Werfen Corporation; Respironics Healthscan Inc. was aquired by Siemens Corporation"

Status: Published

Leskovsek M., M. Lasic and D. Ahlin, "Respiratory physiotherapy and a Web Browser, Feasibility Study," Open Journal of Respiratory Diseases, Vol. No. 3 4, 2013, pp. 150-153. doi: 10.4236 / ojrd.2013.34023.

Link to full article:
http://www.scirp.org/journal/PaperDownload.aspx?paperID=38108

University Medical Centre Ljubljana, Zaloška Road 7, Ljubljana, Slovenia

Reduction of blood pressure by a daily 10 minutes PLB (pursed Lip Breathing) biofeedback training

Principal Investigator: Ana Lasič, Dr. med, Contact: +386 40 588 858

Report: "Pursed Lip Breathing (hereinafter PLB) is a technique of respiratory physiotherapy in which breathe out through pursed lips, which creates positive pressure in the airways and slows expiratory flow, it has effects: 1) slower exhalation and consequently reduced sympathetic tone autonomic 2) increased permeability of airways and thereby lower possibility of airway collapse and 3) a feeling of relief that occurs with any thorough exhalation such as in a yawn, grunt, etc. The purpose of the research is to determine whether breathing exercises guided by a personal computer and equipped with a "PLB biofeedback" system effectively lowers blood pressure. Breathing with a prolonged expiratory has been shown in clinical studies to successfully lower blood pressure in patients with increased blood pressure. The PLB technique to achieve such a long exhale, exhale as over a smaller area of the mouth lasts longer, and additionally also set up a gauge pressure in the lungs, which opens the airways, and expel more air out of the lungs. The study is expected to be attended by 100 subjects, divided we in the 2 groups, which will be matched by sex and age.

- The first group will receive written instructions for performing breathing exercises, which are now well established in clinical practice.
- The second group will perform breathing exercises, guided by computer.

The volunteer will follow the instructions on the PC and you install the sensor breath. A computer program will volunteer interactive guide to breathing with prolonged exhalation. Researcher or monitor the patient before and after exercise, blood pressure measured and recorded at the end of the workout with some precision the volunteer exercise carried out (precision performance work is displayed on the computer after each performed drill). Volunteers will meet after the completion of the intervention questionnaire where they will explain their experience in the implementation of these exercises and their desire for improvement.

- Both groups will perform exercises for 15 minutes.
- Subjects will not know how it is conducted in the second group.
- Criteria will be:

the systolic and diastolic blood pressure before and after the breathing exercises
the saturation of oxygen (non-invasive sensor finger) before and after
on the heart rate before and after
the accuracy of the performance of breathing exercises, as this will be recorded by the sensor PC

All results will be statistically evaluated and no later than 2 years after completion of the study published in the appropriate literature. "Dr. Lasič

Status: In progress.

Home setting (Tele-medicine Project)

Reducing the frequency of breathing through the use of interactive television, which is driven by PLB, healthy subjects, the home environment

Principal Investigator: Ana Lasič, dr. med., Contact: +386 40 588 858

Report: "We have designed a breathing paced television; a television that plays content in sync with users' activity of exhaling through pursed lips, to achieve better motivation and compliance of such exercises. Described system has been tested with control group who have watched the same video. Breathing rate reduction was significantly higher in active group (54.48% ± 8.34%) than in control group (6.84% ± 17.21%). However, the proposed method of watching television is obviously not as trivial as watching television *per se*. Breathing rate reduction was calculated as a normalised difference between breathing rate in the beginning and at the end of the video. To compare breathing rate reduction between groups, we have calculated a mean value, standard deviation and variance of breathing rate reduction in percentages for each group (Figure 4).

Group	N	Mean	Std. deviation	Variance
A	26	54.480055243197	8.3410678330790	69,573
C	25	6.847228678118	17.2122591803222	296,262
Total	51	31.130630456393	27.4833756056068	755,336

To test significant difference between groups, we have observed how breathing rate reduction is normally distributed. To see if the normal distribution is in place, we have used Levene's test for variance and t-test to observe significance of difference between groups.

BRR

Equal variances assumed 13.227 0.001 12.654 49 0.000

Equal variances not assumed 12.498 34.380 0.000

Because significance of t-test is lower than 0.05, the difference between active and control groups is statistically significant.

Conclusion

Breathing rate reduction was significantly higher in active group (54.48% ± 8.34%) than in control group (6.84% ± 17.21%). Although the proposed method of watching television content is obviously not as ordinary as watching television by itself.

Status: Published

Leskovsek, M., Pušenjak, N., Lasic, A. and Ravnik, D. (2014) Breathing Television: A Breathing Controlled Multimedia Player for Reducing Breathing Rate. Open the Journal of Respiratory Diseases, 4, 111-118. doi: 10.4236 / ojrd.2014.44015.

Link to the article: http://www.scirp.org/journal/PaperInformation.aspx?PaperID=49905#.VCUbQvmSx8E

Psychiatric Clinic Temza d.o.o, Ljubljana Dunajska c. 198, Slovenia

Regulation of breathing through a feedback breathing monitoring device reduces attention bias in patients with anxiety disorder

Modifying cognitive bias as a treatment of anxiety disorders has been suggested as an alternative to less accessible and more expensive pharmacological and psychotherapeutic methods. Since it has been shown that breathing disregulations play an important role in pathological reactions to stressful stimuli we suggest an alternative to currently used attention bias modification treatments through the retraining of breathing during response to stressful stimuli. We have present the effects on anxiety levels (AL) and its correlation with attention bias (AB) after a breathing retraining session with a biofeedback breathing device. Subjects with anxiety disorder were asked to use a computer program at their home for 30 days, 10minutes daily. The program would randomly select a threat related image and the subjects were asked to blow into the breathing feedback device to observe the image on the computer screen fade away in accordance to their breathing. Pre and post training attention bias was measured with the dot probe task. State and trait anxiety levels were measured with self reported StateTrait Anxiety Inventory before in the middle and after the training period.

Attention Bias Modification Treatment arises from the notion that cognitive biases cause pathological anxiety, which also underlies models of CBT. The correlation of this two variables is r = 0.78, the degree of correlation, which according to the interpretation table, there is a strong positive linear relationship. So, as the AB Reduction increases, the AL Reduction also increases.

Status: accepted for publication by European Psychiatric Association

Sahmyook University, Seoul, South Korea

The Effects of Game-Based Breathing Exercise on Pulmonary Function in Stroke Patients: A Preliminary Study

Materials and methods:

The breathing trainer (Breathing+ package, Breathing Labs, Slovenia) was provided for this study. It consists of a game application that was downloaded to a laptop as well as a headset. Once the game application is started, the sensor in the headset recognizes the patient's respiration, which initiates the game, depending on the respiratory pressure and the rhythm of the respiratory cycle. This game application includes 14 different games including blowing a balloon, flying a kite, an airplane, and a windmill, etc. Each game has a total of 10 sets and provides the inhalation period, the longest exhalation period, and their average value in real time. The patients' game preferences were taken into consideration, and the patients were allowed to select a specific screen of their choice. To avoid falls, the games were played with the patients seated in an armchair (although not leaning on the back of the chair). In the event that patients felt dizzy or seemed to lose control, a break time was given until normal rhythm and control was regained. The research assistants provided the patients with the instructions, and encouraged the patient to perform the tests, and also demonstrated the game and monitored the patients from the beginning till the end of the game. For a more effective breathing exercise, patients were asked to perform longer exhalations, and the game scores were recorded. Visual feedback of the score motivated the patients to increase their training load. The total duration of the game-based breathing exercises was 25 minutes; breathing control exercise for relaxation was performed for 5 minutes at the beginning and end of this period.

Results:

With regard to pulmonary function, after completing the 5-week intervention program, the FVC was significantly improved from 2.50 L to 3.15 L in the experimental group ($p=0.001$) but was not significantly improved in the control group. The FEV1 was significantly improved from 1.90 L to 2.43 L in the experimental group ($p<0.05$) and from 1.75 L to 1.80 L in the control group ($p<0.05$). In comparing the 2 groups, the degrees of change in the FVC and the FEV1 were statistically greater in the experimental group than in the control group ($p<0.05$). The MVV was significantly improved from 51.36 L/min to 66.56 L/min in the experimental group ($p<0.05$), whereas the MVV was decreased from 53.71 L/min to 49.15 L/min in the control group ($p<0.05$). In comparing the 2 groups, the degree of change in the MVV was statistically greater in the experimental group than in the control group ($p<0.05$). After the intervention, the value of the FEV1/FVC within groups increased (77.79±12.26% from 77.08±15.96% in the experimental and 79.59±13.32% from 71.71±21.36% in the control groups). However, there was no significant difference in the value of the FEV1/FVC between the 2 groups.

Status: Published

Read the full paper here.

Sahmyook University, Seoul, South Korea

A Comparative Study of Smartphone Game with Spirometry for Pulmonary Function Assessment in Stroke Patients

Materials/Methods

Thirty-four stroke subjects (age = 49.24 ± 8.25 years) performed spirometry and the smartphone game on different days. Spirometric values were obtained using a spirometer (SP-1, Schiller, USA). A breathing game application (Breathing+ package, Breathing Labs, Slovenia) was used to obtain the values for the SGA of pulmonary function. The concurrent validity was determined by comparing data collected from the 2 systems, and the reliability was determined by comparing data collected from 3 sessions of using the breathing game on a smartphone.

Results

All parameters demonstrated excellent agreement with intraclass correlation coefficients (ICC (2.1)) values for reliability and concurrent validity.

Conclusion

We compared the relationship between the SGA and the spirometry as certified pulmonary function test. The SGA data were statistically significant and reliable for pulmonary function assessment in stroke patients. It will therefore be useful during rehabilitation to improve pulmonary function and clinical monitoring in stroke patients.

Status: published

Read the full paper here.

Recomendations

American Lung Association

"Keep using the pursed-lip breathing Until the breathless feeling goes away. Rest in between breaths if you feel Dizzy. Give sips of room temperature water."

Cleveland Clinic

"Pursed lip breathing is one of the simplest ways to control shortness of breath. It provides a quick and easy way to slow your pace of breathing, making each breath more effective."

University of Iowa Children's Hospital

“Pursed lip breathing helps you use less energy to breathe. It can help you relax. When you are short of breath, it helps you slow the pace of your breathing and can help you feel less short of breath.”

The Ohio State University Medical Center

“Pursed Lip Breathing keeps airways open longer during exhalation. This helps release trapped air from your lungs and allow fresh air to come in. Practise PLB while you are resting so you can use this technique when you are feeling short of breath.”

University of Minnesota Medical Center

“Inhaling through the nose and exhaling through pursed lips makes breathing easier. Pursed-lip breathing can also help you regain control if you’re having trouble catching your breath. You can practice breathing this way anytime, anywhere. If you’re watching TV, practice during the commercials. Try to practice several times a day. Over time, pursed-lip breathing will feel natural.”

University Health Service, University of Michigan

“Pursed-lip breathing helps you breathe more air out so that your next breath can be deeper.”

Vanderbilt University Medical Center

“Pursed-lip breathing can help you get more oxygen into your lungs when you are short of breath. When you start to feel short of breath, use pursed-lip breathing to control your breathing. Breathing in through the nose and exhaling through pursed or closed lips makes breathing easier.“

UTMB, The University of Texas

“It is often helpful to have a patient with asthma or COPD exhale through "pursed lips," a maneuver that increases resistance to exhalation at the mouth. This maneuver is believed to transmit an early expiratory back pressure to the bronchial tree and the back pressure is believed to prevent early collapse of small bronchioles and improve exhalation from alveoli (specifically COPD patients).”

American Thoracic Society

“Pursed-lip breathing attempts to prolong active expiration through half-opened lips, thus helping to prevent airway collapse. Compared with spontaneous breathing, pursed-lip breathing reduces respiratory rate, dyspnea, and PaCO2, while improving tidal volume and oxygen saturation in resting conditions.