Studia Kinanthropologica, XXVI, 2025, (1), 23–30
The Scientific Journal for Kinanthropology
doi: 10.32725/sk.2025.005

VLIV BUTEYKOVY METODY NA KLIDOVOU SPIROMETRII U AKTIVNÍ POPULACE

THE EFFECT OF THE BUTEYKO METHOD ON RESTING SPIROMETRY IN AN ACTIVE POPULATION

T. Loosová, E. Vrzalová, & L. Počtová

Jihočeská univerzita v Českých Budějovicích, Pedagogická fakulta, Katedra tělesné výchovy a sportu

Abstract

Buteyko method is well-known for its techniques of conscious breath control, which focus on improving respiratory system function. The aim of this study was to assess the impact of the Buteyko method on resting spirometry in an active population. Participants in the study were students of the University of South Bohemia (n = 22, age = 23.23 ± 2.39 years; weight = 73.23 ± 12.33 kg; height = 174.72 ± 9.76 cm), who were randomly assigned to either the intervention (n = 11) or control (n = 11) group. The intervention group underwent a six-week breathing exercise program based on the Buteyko method, which included reduced breathing and breath-holding during walking. The control group did not perform any breathing exercises. Spirometric values, including FVC, FEV_1, and FEV_1/FVC, were measured before and after the intervention for all participants. The results showed a slight decrease in FVC in the intervention group by 3.33 % from 5.29 ± 0.98 l to 5.10 ± 0.99 l, with no statistical or practical significance (p = 0,85; ηp^2 = 0,0009). Changes in FEV_1 in the intervention group were minimal (from 4.35 ± 0.87 $l \cdot s^{-1}$ to 4.32 ± 0.74 $l \cdot s^{-1}$), as were those in the control group (from 4.19 ± 0.76 $l \cdot s^{-1}$ to 4.20 ± 0.74 $l \cdot s^{-1}$), with no practical or statistical significance (p = 0,93; ηp^2 = 0,0001). The FEV_1/FVC ratio slightly increased in both groups, but this increase was not statistically significant (p = 0,73; ηp^2 = 0,002). The results suggest that the six-week Buteyko method intervention did not have a significant impact on changes in spirometric parameters in an active population.

Keywords: Buteyko; breathing; spirometry; intervention; method

Souhrn

Buteykova metoda je známá díky technikám vědomé kontroly dechu, které se zaměřují na zlepšení funkce dýchacího systému. Cílem této studie bylo zhodnotit vliv Buteykovy metody na klidovou spirometrii u aktivní populace. Účastníci studie byli studenti Jihočeské univerzity (n = 22, věk = 23,23 ± 2,39 let; hmotnost = 73,23 ± 12,33 kg; výška = 174,72 ± 9,76 cm), kteří byli náhodně rozděleni do intervenční (n = 11) a kontrolní (n = 11) skupiny. Intervenční skupina podstoupila šestitýdenní program dechových cvičení založený na Buteykově metodě, který zahrnoval redukované dýchání a zádrže dechu při chůzi. Kontrolní skupina neprováděla žádná dechová cvičení. Před a po intervenci byly u všech účastníků naměřeny hodnoty FVC, FEV_1 a FEV_1/FVC pomocí spirometrie. Výsledky ukázaly mírný pokles FVC v intervenční skupině o 3,33 % z 5,29 ± 0,98 l na 5,10 ± 0,99 l, bez statistické či věcné významnosti (p = 0,85; ηp^2 = 0,0009). Změny hodnoty FEV_1 v intervenční skupině byly minimální (z 4,35 ± 0,87 $l \cdot s^{-1}$ na 4,32 ± 0,74 $l \cdot s^{-1}$), stejně jako u kontrolní skupiny (z 4,19 ± 0,76 $l \cdot s^{-1}$ na 4,20 ± 0,74 $l \cdot s^{-1}$), bez věcné i statistické významnosti (p = 0,93; ηp^2 = 0,0001). Parametr FEV_1/FVC se v obou skupinách mírně zvýšil, přičemž tento vzestup nebyl statisticky významný (p = 0,73; ηp^2 = 0,002). Z výsledků vyplývá, že šestitýdenní intervence Buteykovy metody neměla významný dopad na změny spirometrických parametrů u aktivní populace.

Klíčová slova: Buteyko; dýchání; spirometrie; intervence; metoda

Introduction

Many people focus on seeking a healthy lifestyle, paying attention to cold exposure and eating habits; however, they overlook the most essential aspect – proper breathing (Nestor, 2020). For thousands of years, traditional Chinese medicine has emphasized the importance of light, gentle, and quiet breathing (McKeown & Smyth, 2015). Chinese philosophy considers ideal breathing to be so soft and effortless that it is almost imperceptible. Only then does true health emerge (Blofeld, 1978).

In the field of medicine, after many years, the Russian doctor K.P. Buteyko emerges with a philosophy and method that could significantly improve the health of many people around the world (Yakovleva et al., 2016). The Buteyko breathing method, named after its founder Dr. Konstantin Pavlovich Buteyko, is a technique focused on modifying breathing patterns. It is a breathing therapy that utilizes breathing exercises and self-regulation of breath to treat diseases that are believed to be caused by dysfunctional breathing. Among the health issues it claims to cure through breathing are all types of allergies, chronic obstructive pulmonary disease, eczema, heart rhythm disorders (tachycardia, arrhythmia), varicose veins, and others (Yakovleva et al., 2016).

The method is based on the assumption that a number of health issues, including asthma, are triggered or worsened by chronically increased breathing frequency or hyperventilation. During excessive breathing (hyperventilation) a large amount of carbon dioxide (CO_2) is expelled from the body, leading to a decrease in CO_2 levels in the lungs, tissue cells, and blood. A lack of CO_2 causes changes in blood pH and contractions of the bronchi, blood vessels, intestines, and smooth muscles. Spasms of the smooth muscles reduce oxygen supply to the body, resulting in oxygen deprivation, which in turn leads to excessive breathing – hyperventilation (Yakovleva et al., 2016).

Hyperventilation, as a respiratory disorder, is estimated to affect 9.5 % of the adult population (Jones et al., 2013). Brashear (1983) reports the occurrence of hyperventilation syndrome in 6–11 % of the total patient population. The Buteyko technique helps restore proper breathing patterns through repeated breathing exercises that therapeutically reduce hyperventilation and address other related issues. The treatment includes a set of breathing exercises focused on reduced breathing, nasal breathing, and relaxation (Singh & Raghavendran, 2021).

A randomized study by Cowie et al. (2008) in Canada included 129 patients with asthma. In the group that practiced the Buteyko method, the proportion of patients with good asthma control increased from 40 % to 79 % after six months of intervention. Additionally, the group significantly reduced inhaled corticosteroid therapy ($p = 0.02$).

The implementation of the Buteyko breathing program had positive effects on improving pulmonary function tests and quality of life in asthma patients. Statistically significant differences were confirmed in the parameters FVC, FEV_1, and FEV_1/FVC (Elkafrawy et al., 2024).

Mortality from cardiovascular diseases remains very high each year. Hypertension affects a large portion of the global population. The beneficial effects on cardiorespiratory parameters were described in a study by May (2022). The project confirmed a statistically significant difference in heart rate, systolic blood pressure, respiratory rate, vital lung capacity, and breath-hold time due to the influence of the Buteyko breathing intervention.

The essence of the Buteyko method, and one of its main pillars, is nasal breathing (Yakovleva et al., 2016). Breathing through the mouth requires less energy than breathing through the nose, and when this habit persists pathologically, it can lead to the weakening of respiratory muscles and the formation of chest and spine deformities, such as a flat chest or Harrison's groove (Máček, 2001). Mouth breathing activates the upper chest and involves deeper breaths compared to nasal breathing. This habit can lead to a restriction of oxygen supply to the arterial blood (Swift et al., 1988). Two Brazilian studies report that more than fifty percent of children breathe through their mouths, but the numbers may be even higher (Menez et al., 2006).

Spirometry is one of the basic diagnostic methods. It helps to detect ventilatory function disorders and assess their severity. This diagnostic method allows for the early detection of abnormalities and facilitates the initiation of treatment. It is a physiological test that evaluates an individual's ability to inhale and exhale air volume. In both sports and clinical fields, vital lung capacity is most commonly measured using FVC, along with other time-dependent dynamic parameters such as: FEV_1, FEV_3, or FEV_1/FVC (Kociánová, 2017). Bartůňková et al. (2013) state that higher values of vital lung capacity can be achieved through endurance training, and these values are also influenced by body composition or chest size.

The mechanics of breathing play a key role in endurance sports. The quality of breathing mechanics affects the vital lung capacity. Bahenský et al. (2016) state that an eight-week intervention with breathing waves had a significant impact on the capacity for forced vital capacity (FVC), which improved by 6 %, as well as the volume of exhalation per second (FEV1), which increased by 6.1 %. No statistically significant changes were observed in the control group.

The aim of this work is to determine whether the Buteyko method has an effect on resting spirometry in an active population.

Metods

Sample of participants

The participants in the study were students of the University of South Bohemia in České Budějovice. The selection criterion was the resulting active status according to The Godin-Shephard Leisure-Time Physical Activity Questionnaire (Godin, 2011) within the age range of 19–29 years. A total of 22 participants took part in the study, and they were randomly assigned (by drawing lots) to the intervention (n = 11) and control (n = 11) groups. The average age of the intervention group at the time of assessment was 24.00 ± 2.63 years, the average body weight was 74.75 ± 12.70 kg, and the average height was 173.98 ± 10.84 cm. The average age of the control group was 22.45 ± 1.83 years, body weight 71.71 ± 11.75 kg, and height 175.46 ± 8.50 cm. The research sample of both the intervention and control groups consisted of six men and five women. Resting spirometry testing was conducted at the Laboratory of Exercise Diagnostics at the Department of Physical Education and Sport at the University of South Bohemia in České Budějovice. All participants were informed about the research conditions. All members signed an informed consent, and all procedures were carried out in accordance with ethical standards and the Helsinki Declaration. This study was approved by The Ethical Committees of the Faculty of Education, University of South Bohemia on November 1, 2021 (020/2021).

Experimental desing

Participants in both the intervention and control groups underwent resting spirometry testing at the same time of day, without the use of caffeine, at least two hours after a meal, and were also required to avoid strenuous physical activity for at least twenty-four hours prior to the testing. The resting spirometry examination included the measurement of forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), and the percentage ratio between the parameters FEV1/FVC, using the Cortex MetaControl 3000 system.

The basis for creating the intervention program focused on the breathing method was the material obtained from professional publications, including *Breathe to Heal* (Yakovleva et al., 2016), *Oxygen Advantage* (McKeown & Smyth, 2015), and *Close Your Mouth* (McKeown, 2004). The program was developed based on available information and professional literature, and was adapted to the specifics of the study and the needs of the examined group.

The Buteyko method intervention program was designed as a six-week training cycle. During this time, participants regularly performed specific breathing exercises that focused on reduced breathing, breath holds while walking, and promoting nasal breathing.

The reduced breathing exercises were performed regularly every day, three times a day – in the morning, at noon, and in the evening. The average duration of each breathing exercise was 12.02 ± 0.31 minutes. Each exercise was divided into several phases. During the first two minutes, the focus was on conscious awareness of the breath and relaxing the muscles in the abdomen, shoulders, and face. The following three-minute phase focused on gradually lengthening the exhalation. The final phase, lasting from the sixth to the tenth minute, was dedicated to gradually reducing the volume and duration of inhalations. The exercise should induce a mild sensation of air shortage, which is desirable and represents the core principle of the method.

The daily routine also included breath holds while walking. The breath hold was applied twice a day, in the morning and afternoon. The exercise began with natural walking for a minimum of one minute, during which participants maintained their usual breathing rhythm. This was followed by holding the breath after a short exhalation. The movement was smooth and continuous, with the key being to avoid excessive muscle tension or gasping breaths. The duration of the breath hold was individual and depended on the subjective tolerance to increased carbon dioxide levels, with the optimal goal being to reach a moderate intensity of the urge to inhale. It was not about maximum breath holding. After completing the breath hold, it was essential to immediately restore the natural breathing pattern to the values prior to starting the exercise. It was recommended to perform the exercise in pairs.

The intervention control involved regular daily monitoring of participants' participation in the breathing exercises and their adherence to the program, with participants being regularly questioned through an online communication platform. Additionally, the correctness of the exercise technique was ensured through feedback.

The control group did not participate in any breathing exercises or other forms of breathing-related intervention. Instead, they were instructed to maintain their usual daily routine without any interference with their breathing pattern or the intensity of physical activity. Throughout the experiment, both the control and intervention groups did not experience any respiratory or other illnesses. Physical activity was also monitored in both groups, ensuring that differences in spirometry results were not caused by varying levels of physical activity. According to the physical activity questionnaire (Godin, 2011), the value on the Godin scale for the intervention group before the intervention was 67.36 ± 28.04, and after six weeks it was 67.64 ± 33.35 points. The control group had values of 63.64 ± 18.47 and 64.09 ± 18.23 points.

After six weeks of the Buteyko method intervention program, participants from both the intervention and control groups were again subjected to resting spirometry measurements. The initial spirometry data, which were obtained before the start of the intervention, were then compared with the results after completing the Buteyko method program. Comparing these data allowed for the analysis of changes in spirometry parameters, providing evidence of the effectiveness of the exercises in improving the respiratory functions of the participants.

Statistical data processing

The data are presented as arithmetic mean, standard deviation, and mean differences. The normality of the data was checked using the Shapiro-Wilk test. To assess the effect of the intervention, a two-way analysis of variance (Two-way ANOVA) was used with a significance level of $\alpha = 0.05$, supplemented by the calculation of partial eta squared (ηp^2) to determine the effect size. The effect size boundaries were set as follows: small effect $\eta p^2 < 0.05$; medium effect $\eta p^2 > 0.06 < 0.13$; and large effect $\eta p^2 > 0.14$. Statistical analysis was performed using Statistica 14 software (TIBCO Software Inc.).

Tabulka 1./ Table 1.
Změny FVC v experimentální a kontrolní skupině před (pre) a po (post) intervenci./ Changes in FVC in the experimental and control groups before (pre) and after (post) the intervention.

FVC [l]		Mean ± SD	MD	ANOVA p; ηp^2	Result
Experimental (n = 11)	Pre	5.29 ± 0.98	-0.2	0.85; 0.0009	NS
	Post	5.10 ± 0.99			
Control (n = 11)	Pre	4.93 ± 1.09	-0.08		
	Post	4.85 ± 1.02			

Note. FVC – Forced vital capacity; MD – Mean difference; Pre – Before the intervention; Post – After the intervention; p – Statistical significance; ηp^2 – Effect size; NS – Not Significant.

Results

For the tested sample, we measured FVC before the intervention as 5.29 ± 0.98 l and after the intervention as 5.10 ± 0.99 l in the experimental group, with the mean difference (MD) being 0.2 l. In the control group, the FVC value before the intervention was 4.93 ± 1.09 l and after the intervention decreased to 4.85 ± 1.02 l, with a mean change of 0.08 l (see Table 1). In the analyzed sample of the intervention group, a decrease in tidal volume during FVC of 3.33 % was recorded, while in the control group, a decrease of 0.74 % was observed. This change was not statistically ($p = 0.85$) nor practically ($\eta p^2 = 0.0009$) significant for both the intervention and control groups.

For the tested sample, we measured FEV_1 values before and after the intervention. In the experimental group, the average value before the intervention was 4.35 ± 0.87 $l \cdot s^{-1}$ and after the intervention it was 4.32 ± 0.74 $l \cdot s^{-1}$. The percentage difference between the tests was 0.13 %. In the control group, the FEV_1 value before the intervention was 4.19 ± 0.76 $l \cdot s^{-1}$ and after the intervention it was 4.20 ± 0.74 $l \cdot s^{-1}$, with the average difference being 0.51 %. These changes were not statistically ($p = 0.93$) nor practically ($\eta p^2 = 0.0001$) significant (see Table 2).

Tabulka 2./ Table 2.
Změny FEV_1 v experimentální a kontrolní skupině před (pre) a po (post) intervenci./ Changes in FEV_1 in the experimental and control groups before (pre) and after (post) the intervention.

FEV_1 [$l \cdot s^{-1}$]		Mean ± SD	MD	ANOVA p; ηp^2	Result
Experimental (n = 11)	Pre	4.35 ± 0.87	-0.03	0.93; 0.0001	NS
	Post	4.32 ± 0.74			
Control (n = 11)	Pre	4.19 ± 0.76	0.01		
	Post	4.20 ± 0.74			

Note. FEV_1 – Forced expiratory volume in one second; MD – Mean difference; Pre – Before the intervention; Post – After the intervention; p – Statistical significance; ηp^2 – Effect size; NS – Not Significant.

No statistically (p = 0.73) or practically ($\eta p^2 = 0.002$) significant changes in the FEV_1/FVC parameter were observed in the analyzed sample. In the experimental group, the average value before the intervention was 82.91 ± 11.77 % and after the intervention it was 85.45 ± 5.93 %, with the average difference being 2.55 %, corresponding to a relative change of 5.44 %. In the control group, the FEV_1/FVC value before the intervention was 86.18 ± 5.89 % and after the intervention it was 87.00 ± 7.26 %, with an average difference of 0.82 % (see Table 3).

Tabulka 3./ Table 3.
Změny FEV_1/FVC v experimentální a kontrolní skupině před (pre) a po (post) intervenci./ Changes in FEV_1/FVC in the experimental and control groups before (pre) and after (post) the intervention.

FEV_1/FVC [%]		Mean ± SD	MD	ANOVA p; ηp^2	Result
Experimental (n = 11)	Pre	82.91 ± 11.77	2.55	0.73; 0.002	NS
	Post	85.45 ± 5.93			
Control (n = 11)	Pre	86.18 ± 5.89	0.82		
	Post	87.00 ± 7.26			

Note. FEV_1/FVC – Ratio expressed as a percentage; MD – Mean difference; Pre – Before the intervention; Post – After the intervention; p – Statistical significance; ηp^2 – Effect size; NS – Not Significant.

Discussion

The aim of the study was to determine whether the Buteyko method intervention program has an effect on resting spirometry in an active population. While the intervention group performed breathing exercises for six weeks, no intervention was applied to the control group.

Spirometry is a key method used for diagnosing, monitoring, and therapeutically managing patients with pulmonary diseases (Barreiro & Perillo, 2004). In our study, we found that the average percentage of FEV_1 to FVC at the baseline measurements for the experimental group was approximately 82.23 %, while for the control group, it was 84.99 %. These values fall within the range reported in the literature, which states that FEV_1 typically accounts for 70 to 90 % of total vital lung capacity (Mourek, 2012). These findings confirm the importance of FEV_1 as a key indicator of lung function.

Research to verify the Buteyko method primarily focuses on its effectiveness in treating asthma and, more recently, sleep apnea. Several publications have been released on its effectiveness in this area (Bowler et al., 1998; Cooper et al., 2003; Vegedes et al., 2021; Lina et al., 2013). Clinical research shows that the Buteyko method can significantly reduce medication use without worsening asthma or lung function (Courtney, 2008).

Existing research shows that the Buteyko method may contribute to improving quality of life and reducing the need for pharmacological treatment. The study by Opat et al. (2000) recorded a significant improvement in subjectively perceived health in individuals assigned to the intervention group compared to the control group. At the same time, a statistically significant reduction in the use of inhaled bronchodilators was observed, suggesting the potential benefits of this method for individuals with respiratory issues.

Our data indicate that the breathing method had no effect on resting spirometry, nor on any of the measured parameters. In this regard, our findings align with the study by Cooper et al. (2003), which found no difference in FEV_1 values between the groups. However, this study led to an improvement in symptoms and a reduction in the use of bronchodilators. The study included sixty-nine asthma patients who were monitored for a period of six months.

The data we measured also align with the study by Bowler et al. (1998), where no statistically significant changes were observed in the FEV_1 parameter after a twelve-week intervention. Similarly, the study by McHugh et al. (2003), which included asthma patients aged eighteen to seventy, did not demonstrate a statistically significant difference in the forced expiratory volume in one second. This controlled study compared the Buteyko method with a control group and followed participants for six months after the intervention. These findings suggest that the benefits of the Buteyko method may be more noticeable in the improvement of the subjective perception of asthma control rather than in objective indicators of lung function.

In contrast to our findings, the study by Ilyas (2024) demonstrated that the Buteyko method significantly improves spirometric parameters (FVC, FEV_1, FEV_1/FVC) and achieves better results than the Papworth technique. These findings suggest that breath control can positively affect resting spirometry. However, the differences between our results and these findings may be attributed to differences in the characteristics of the studied populations. The participants in Ilyas' study were primarily individuals with asthma or individuals aged thirty to fifty-five, who were found to have a predicted FEV_1 under 80 % and an FEV_1/FVC ratio lower than 75 %. In these individuals, who show some degree of lung dysfunction, the effect of the Buteyko method may be more noticeable, as improvements in ventilation are usually more pronounced in patients with respiratory issues.

Similar results are presented in the study by Elkafrawy et al. (2024), which also confirmed the positive effects of the Buteyko method on lung function. After three and six months of the Buteyko method training program, significant changes were observed in the values of FEV_1, FVC, and FEV_1/FVC. These results support the view that the Buteyko method may contribute to improving lung function, which aligns with previous research. However, differences in the duration of the intervention, as well as differences in the demographic characteristics of the participants, may explain the discrepancies in the results.

The main limitations of the study include the fact that it was conducted with a sample of twenty-two participants, which limits the generalizability of the conclusions. Although the sample size was limited, strict criteria for inclusion and exclusion of participants were followed. One limitation of this study is its focus exclusively on individuals with a higher level of physical activity. The selection criterion included participants who met the physical activity requirements according to the Godin questionnaire (2011), meaning that the results may not be applicable to individuals with lower levels of physical activity.

The study also faces a limitation in the form of the intervention period length, which was six weeks. This timeframe may not be sufficient to assess the long-term effects of the Buteyko method on spirometric parameters. A longer follow-up period could provide more relevant information about the stability of the achieved changes.

Among the potential factors affecting the results was the regularity of performing the breathing exercises. Although participants were instructed to perform the exercises regularly, it was not possible to objectively verify their actual adherence, which may have led to individual differences in the results.

Conclusion

In this study, no statistically or practically significant changes were observed in the spirometric parameters of the analyzed sample. In the experimental group, there was a slight decrease in the values of FVC and FEV_1 following the intervention, but these changes were not significant. A similar trend was observed in the control group, where the differences between measurements were also minimal. The FEV_1/FVC ratio showed a slight increase in both groups, but this change was neither statistically nor practically significant. This study did not demonstrate the effect of the Buteyko method on spirometric indicators in the tested sample.

Literature

Bahenský, P., Malátová, R., & Mareš, M. (2016). Vliv intervenčního programu dechových cvičení na vitální kapacitu plic the influence of intervention of breathing training programme on vital lungs capacity. *Studia Kinanthropologica, 177.*

Barreiro, T. J., & Perillo, I. (2004). An approach to interpreting spirometry. *American family physician, 69*(5), 1107–1115.

Bartůňková, S., Heller, J., Kohlíková, E., Petr, M., Smitka, K., Štefl, M., & Vránová, J. (2013). *Fyziologie pohybové zátěže.* UK FTVS.

Blofeld, J. (1978). *The road to Immortality.* Shambhala.

Bowler, S. D., Green, A., & Mitchell, C. A. (1998). Buteyko breathing techniques in asthma: a blinded randomised controlled trial. *Medical journal of Australia, 169*(11–12), 575–578.

Brashear, R. E. (1983). Hyperventilation syndrome. *Lung, 161*, 257–273.

Cooper, S., Oborne, J., Newton, S., Harrison, V., Coon, J. T., Lewis, S., & Tattersfield, A. (2003). Effect of two breathing exercises (Buteyko and pranayama) in asthma: a randomised controlled trial. *Thorax, 58*(8), 674–679.

Courtney, R. (2008). Strengths, weaknesses, and possibilities of the Buteyko breathing method. *Biofeedback, 36*(2), 59–63.

Cowie, R. L., Conley, D. P., Underwood, M. F., & Reader, P. G. (2008). A randomised controlled trial of the Buteyko technique as an adjunct to conventional management of asthma. *Respiratory medicine, 102*(5), 726–732.

De Menezes, V. A., Leal, R. B., Pessoa, R. S., & Pontes, R. M. E. S. (2006). Prevalence and factors related to mouth breathing in school children at the Santo Amaro project-Recife, 2005. *Brazilian journal of otorhinolaryngology, 72*(3), 394–398.

Elkafrawy, L. S., Saleh, N. M. H., Ahmad, M. A. S. A., & Mohamed, H. N. A. E. A. (2024). Effect of Buteyko Breathing Exercise on Pulmonary Functions Tests and Quality of Life in Asthmatic Elderly Patients. *International journal of Nursing Didactics, 14*(07), 01–12.

Godin, G. (2011). The Godin-Shephard leisure-time physical activity questionnaire. *The Health & Fitness Journal of Canada, 4*(1), 18–22.

Hendl, J. (2004). *Přehled statistických metod zpracování dat: Analýza a metaanalýza dat.* Portál.

Ilyas, A., Ahmad, J., & Khalid, F. (2024). Comparison of Buteyko and Papworth Breathing Techniques on Pulmonary Function and Oxygen Saturation in Asthma Patients. *Link Medical Journal of Health and Community Research, 2*(1), 44–52.

Kociánová, J. (2017). Spirometrie–základní vyšetření funkce plic. *Vnitřní lékařství, 63*(11), 889–894.

Lina, R. C., Leysa, M. D. V., Libozada, Z. D., Lirio, M. F. I., Liwag, A. A., Ramos, G. D., & Natividad, M. M. (2013). *Effectiveness of Buteyko method in asthma control and quality of life of school-age children.*

May, M. P. (2022). Effect of Buteyko breathing technique in hypertensive patient thesis. *Journal of Society of Indian Physiotherapists, 4*(1), 14–15.

McHugh, P., Aitcheson, F., Duncan, B., & Houghton, F. (2003). Buteyko Breathing Technique for asthma: an effective intervention. *The New Zealand medical journal, 116*(1187), U710.

Máček, M. (2001). Pohybová aktivita při chronických chorobách dýchacího ústrojí u dětí a dospělých. *Med Sport Boh Slov*, (10), 1–10.

McKeown, P. (2004). *Close your mouth.* Buteyko Books an Imprint.

McKeown, P., & Smyth, A. (2015). *The oxygen advantage.* Little, Brown Book Group.

Mourek, J. (2012). *Fyziologie-Učebnice pro studenty zdravotnických oborů.* Grada.

Nestor, J. (2020). *Breath: The new science of a lost art*. Penguin.
Opat, A. J., Cohen, M. M., Bailey, M. J., & Abramson, M. J. (2000). A clinical trial of the Buteyko breathing technique in asthma as taught by a video. *Journal of Asthma, 37*(7), 557–564.
Singh, G., & Raghavendran, M. (2021). Buteyko Breathing Technique. *Journal of Nursing Education and Practice, 7*(2), 13–16.
Swift, A. C., Campbell, I. T., & Mckown, T. (1988). Oronasal obstruction, lung volumes, and arterial oxygenation. *The Lancet, 331*(8577), 73–75.
Vagedes, J., Helmert, E., Kuderer, S., Vagedes, K., Wildhaber, J., & Andrasik, F. (2021). The Buteyko breathing technique in children with asthma: a randomized controlled pilot study. *Complementary Therapies in Medicine, 56*, 102582.
Yakovleva, S., Buteyko, K. P., & Novozhilov, A. E. (2016). *Breathe To Heal. Break Free from Asthma*, Breathing Center LLC (Ed.).

Bc. Tereza Loosová
KTVS PF JU
Na Sádkách 2a/305
370 05 České Budějovice
loosot00@pf.jcu.cz