

STRESS MANAGEMENT IN YOUNG FEMALE SPORTSMEN THROUGH BREATH AND MOVEMENT SYNCHRONIZING

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Abstract: *There are basic conditions of high quality vitality and effective stress management. Specificity of easy yoga practicing is the active correction of movement stereotypes, positives influence on muscle and mental tensions and synchronizing of breath and movement, which results in harmony state of mind. Basic yoga breathing techniques lead to breathing control and breathing capacity development. These techniques relatively easy can be trained. The objective of study was to test psycho-training methods on base of yoga techniques which can demonstrate benefits of breathing exercises in sportsmen, concretely to determine the individual indicators in different positions and exercises in junior female players of water polo. The research sample consisted of 10 female water polo players of the Czech junior national team in the age of 14 - 16 years. In the study was used a survey research instrument Biofeedback Shuhfried x-pert 2000, and provided testing through the POMS (Profile of Mood States) test. Intervention program was realised in 12 weeks. After the intervention program significant positive changes in emotional states of participants have been found. After completion of the intervention program was again carried out an expert examination. All participants have acquired full yogic breathing and mastered breath regulation according stress situation. The hypothesis was verified.*

Key words: *Stress management; breathing regulation; yoga techniques; female players; water polo.*

1 Introduction

It is said that Life is Breath, which implies that as long as a person breathes he/she is living. The indication of life is breathing and from this logic, “The healthy breathing implies healthy life.” The base of that is mastering in the full yoga breath and after in other pranayama techniques, which develop breathing process, its deepness and control.

Every change in social milieu has a psycho – somatic response in the organism with a health impact. The change of situation is in first evaluated through the “psychic filter” with

follow health impact (e.g. impact in body or it manifests as a mental-social effect) It depends of that, if situation is perceived as a stressful, endangering (e.g. evoking unsafely, destruction of psychosomatic integrity or too much stimuli together) or if can be accepted, positively evaluated or solved thanks the will. Through the “psychic filter” gone and are evaluated also signals coming from inside, from organism (e.g. burst of pain, palpitation). Just on completely subjective evaluation depends, if the response will be at last positive or negative from the view of health impact. If the situation is understood as endangering, symphateticus is mobilized together with noradrenalin and adrenalin mobilization. If the subjective stress repeats often or permanently, another hormone response in organism is mobilized, especially from the adrenal cortex (glucocorticoids, mineralocorticoids) and from other glands. This fact has very negative impact in immune system and allergic reactions.

Role of breath is very significant in human and animal physiology. Normal human beings take about 12-20 breaths per minute. However under various physiological conditions, age and health factors, these parameters change. During resting phase it may go down and it can escalate when human being are in exercise mode.

Diaphragmatic breathing

During the diaphragmatic breathing (so called “abdominal” breath) is used effectively the main breath muscle – diaphragm - which results in gas exchange in the lower part of lungs. During the inhalation phase the diaphragm is activated, expands and the abdominal wall rising. During the exhalation the diaphragm is relaxed and the abdominal wall slops down. Main benefits are calming and harmonizing of mind and compensation and regeneration of physical and psychic stress. Very effective yoga position for diaphragmatic breathing development is for example shashanka asana (see Figure 1), which improves blood supply to the head and therefore nourishes the eyes and all brain functions. Helps to relieve fatigue and promotes concentration. Anxiety and depression are relieved due to its calming effect. The whole spine and muscles of the back relax in this position and the breath deepens into the back and lungs. Diaphragmatic breathing gently massages the digestive organs.



Figure 1 *Diaphragmatic breathing in the position “Shashanka asana”*

Thoracic breathing

In this type of breath the main function play intercostal muscles. During the inhalation phase these muscles are activated and thorax rising. Exhalation phase is passive, exhalation is provided thanks the elasticity of thorax, which slops down. Active exhalation can be provided too, when intercostal muscles are activated again and support gas exchange in the middle of the lungs. External intercostal muscles participate in inhalation phase; internal intercostal muscles participate in exhalation phase. Both phases help to blood circulation and to heart work. Deep breathing process is significantly positive in blood circulation and helps to condition in aerobic activities. Very effective yoga positions for thoracic breathing development are for example matsja asana, dhanur asana.

Clavicular breathing

In clavicular breathing gas changing in upper part s of lungs and apexes of lungs is provided. From the view of mechanism this realization is same as in thoracic breathing. Only to the intercostal help also musculi skaleni. Normal people, who are not trained in breathing use these muscles only in a case of breath stress (asthmatic attack, asphyxia). Important benefit of the clavicular breathing is apexes of lungs purification, which is important for stamina of cellules in alveoli. Therefore this breathing presents an asthma prevention and prevention of inflammation in this area.

Connection of all three breathing types, full yoga breath

For the deep breathing and vital capacity promotion all three types of breathing are connected in so called full yoga breath. Benefits are in vital capacity restoring or development, calming effect and stress elimination. For the training and harmonizing of the

full yoga breath several exercises can be used. Very effective is for example movement sequence “mardjari”, called also “cat”. Very useful are also different exercises with movements of arms – in lying, sitting standing positions. Throwing up is inhalation, closing arms to the body is exhalation.

Optimal breathing is based on scientific principles of breathing in which there is optimal utilization of lung capacity. Optimal breathing exercises focus breathing training for complete breathing of lungs. These exercises give full stretch to lungs and thus they can inhale, hold and exhale in far better way than normal breathing pattern. Lung volume depends upon various factors like: age, sex, smoker versus non-smoker etc. Athletes are supposed to possess bigger lung capacity in comparison to non-athletes. Several factors affect lung volumes; some can be controlled and some cannot. Factors which are more associated with a person about his or her lung capacity are; being a male, a taller person, non-smoke, an athlete, and living at high altitude.

Breathing plays very significant role in creating of body awareness. In facts in therapy sessions, it is a common practice that client observes his/her breathing pattern to become more Self-aware. It is not merely the oxygen which people breathe. The science of breathing is much deeper. It is not merely taking air inside the body, but it is something related to vital force. This concept points to the role of vital energy which exists in Universe and in the process of appropriate breathing technique; it can be acquired inside the body.

There is a clear cut message that breathing delivers following health benefits

- Saves from infections
- Builds better body resistance
- Enhances stamina and vigour

In our previous interventions and researches with yoga techniques applications oriented on mental training of sportsmen, on concentration effects, etc. (Krejčí 2009; Tuli 2004) the breath exercises brought wide progress. In all cases they had harmonies effects on nervous and motor system. If muscles are in permanent contractions, the blood circulation is blocked, and this fact corresponds with psychic lability (Berger, Pargman & Weinberg, 2002, Maheshwarananda 2006, Pišot et al. 2008).

Thinking process and breathing process are in the close relationship. If sportsman is irritate, his breath becomes irregular, slight, loud and limited in up chest. If the sportsman is calm and relaxed, the breathing process is deep, slow, and regular with usage of whole breathing capacity (diaphragm breath). This principle is possible to use in such way, that

during the change of breathing it is possible to change emotions of sportsmen and harmonize their psyche. Especially the full yoga breath and “Nadi shodhan“ (breathing through left and right nostril) present special techniques to calm and balance their nervous system. The breathing technique “Bhastrika“(quick changes of inhalations and exhalations, separately through left and right nostril and after through both nostrils) has a processes and it is very beneficial for vitality improving. Bhavanani, Madanmohan, Udupa (2003) reported that bhastrika has an important effect on central neural processing by studying its effect on reaction time. This is of applied value in situations requiring faster reactivity such as sports, machine operation, race driving etc. It may also be of value to train mentally sportsmen who have prolonged the reaction time.

Effects of breathing exercises improve muscle relaxation, remove muscle tiredness and venous recovery, and develop hypoxia adaptability of tissues. Establishment of correct breath rhythm initiates gentle massage of abdomen organs. Effects are in decreasing of tension and stress, improvement of Self-confidence, development of concentration (see Figure 2).

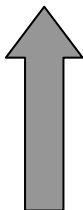
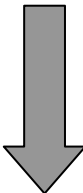
<i>Physiology Changes during Stress and Relaxation</i>		
Stress	Changes	Relaxation
	Muscle tension Breath acceleration Pulse acceleration Blood pressure Material Exchange Some Hormones Electrostatic induction EEG	

Figure 2 *Physiology Changes during Stress and Relaxation*

They are generally based on sound physiological principles, and though designed for more esoteric goals, can serve well for promoting relaxation, optimal lung function, emotional balance and self-regulation of various kinds. Fundamental principles of yogic breathing are discussed in the paper (e.g. diaphragmatic breathing, nasal versus mouth breathing, slow exhalation with pauses, smoothness and steadiness, self-observation of breathing).

Observing of own breathing is the base of relaxation and concentration techniques to reduce stress and mental tensions. Breathing observing also can help to self-esteem development and satisfaction establishment.

2 Objective (hypothesis, research questions)

The main objective of the presented study was to test psycho-training methods on base of yoga techniques which can demonstrate benefits of breathing exercises in sportsmen. A partial objective of measurements was to determine the individual indicators in different positions and exercises in junior female players of water polo.

Research question: Due to the intervention program participants are able to master proper breathing regulation, so that they can control the states of tension.

3 Methodology

3.1 Characteristics of sample

The research sample consisted of female players in water polo junior national team of the Czech Republic. The total number of participants was 10. They were in the adolescent age of 14 - 16 years. The average age was 14.9 years, 7 participants were 15 years old, 2 participants 14 years old and 1 participant 16 years old.

All participants were informed about the research method Biofeedback Shuhfried x-pert 2000, and also it was explained them process of testing in the POMS test. They were informed about the anonymity of the data obtained in the research study. In the beginning of the intervention program and diagnostic methods, according to age of participants, all parents were informed and they gave written consent for the investigation and intervention of child.

3.2 Research organization

In the study was used a survey research instrument Biofeedback Shuhfried x-pert 2000, and provided testing through the POMS test. Intervention program was realised in 12 weeks. In the first half (6 weeks) the intervention program was implemented once per week before training of water polo. In the second half (6 weeks) the intervention program was implemented twice per week before training of water polo. The entire program including measurements was conducted in the swimming pool area. For the evaluation of the results were used casuistic analyses and t-test.

3.3 Methods

Diagnostics

- *Measuring devices using Biofeedback Shuhfried x-pert 2000*

Several physiological changes were observed. On the body of the participants were attached modules of sensing breathing in the chest and abdomen, modules of sensing skin conductance, pulse, blood flow and body temperature. The data were transmitted to a computer wirelessly via blue-tooth. After testing the functionality of the device, first began measuring of participant in lying position with eyes open. After some time, he was instructed to close his eyes. Followed by 3 times movement sequence of breathing exercise in a kneeling position (Mardjari breath, the cat) and the end of the breathing exercises in a sitting position with voice resonance (chanting "Om").

- *Profile of Mood States -POMS*

The test was used in the Czech version (Stuchlíková, Man, Hagtvet 2005)

Statistics

Data were charted, analysed and evaluated using statistical methods t - test.

Intervention

Training units lasted 60 minutes. Each session started with a short lecture on yoga and its effects on the human body. This was followed by a short relaxation. After various yoga exercises (sarvahitaasanas) were included in the program. After that a short relaxation in lye position followed before breathing exercises and sitting position with voice resonance (chanting "Om").

In the end of sessions individual summary and recommendations were given (what should participants master at home and what awaits them in the next lesson). Each exercise was first explained and presented. When exercise was done a thorough inspection of performance of exercises to each participant separately, effects of each exercise were explained. Intervention program was implemented by the Yoga in Daily Life System (Maheshwarananda 2006), to ensure continuity of exercises.

Examples of psycho-training methods on base of yoga techniques:

Inner silence, Senses and emotions control

For every day it was recommended to provide a relaxation for several minutes and to observe the breathing process. Negative thoughts not only disturb one's mind they also create

stress or alarm response in the body. In such case it was recommended to provide the full yoga breath technique with concentration on breathing process.

Self – confidence, faith

It is possible to provide visualization and analyse of a situation, to change it, to learn from it, to change behaviour and habits. This part leads to endure through and overcome all difficulties. Observe all problems like a spectator and solve them with detached mind. Before the analyse it is possible to practice technique “Nadi Shodhan” (literally "Cleaning of nerves") 10 - 20 times inhalation and exhalation through left and after right nostril. The exercise helps to be calm and sure with self.

Independence, freedom, purpose

This part leads to stand above things, to be independent. To cut the dependency on some kind of things, conflicts etc. It is very important in sportsmen to develop determination and purpose. Whatever may come, their aspiration should be directed solely to the goal. Very important is to be concentrated on goal and be patience and calm.

4 Results and discussions

The results show that after the intervention program have been found positive changes in emotional states of participants. Significant changes were analysed in the category "F – fatigue". Before starting of the program, the team had a very difficult training period in the national team and quite a lot of difficult matches. These facts certainly are reflected in the rating of the category "fatigue". Participants reported that yoga asanas, breathing exercises and relaxation helped them to re-gain strength and energy. Linked to this shift in category "V - vitality" where there has been a significant change in categories “zippy” and “full of life”. A positive significant shift was recorded also in the category "T - tension". Another positive significant shift was in the "A - anger". It can be concluded that after the yoga intervention program were analysed significant ($p=0.05$) positive changes in emotional indicators of participants. Relaxation and breathing techniques reduce mental tension and reduce stress and ultimately bring feelings of happiness and satisfaction. In the category "D - depression", the input and output values were no significant. This shows the balance of participants, but also a good social background and relationships in their sport environment.

In Biofeedback Shuhfried x-pert 2000 method diaphragmatic breathing, deep breathing and heart rate were analysed, but also respiratory rate, skin resistance, skin temperature, blood volume, heart rate range and sensing of body movement. All data were processed in Excel and statistically evaluated. The most interesting results were the first three

mentioned, which will be discussed. During relaxed breathing in supine with eyes open and then with eyes closed, it was found out that respiratory amplitude are balanced and gradually increasing. The largest value was achieved during the breathing exercise in a kneeling position (Mardjari breath, the cat). Unexpected the most consistent values were obtained during the breathing exercise in a sitting position with voice resonance (chanting "Om"), where respiratory wave is smooth and deepened. Breathing gradually deepened with the gradual release of the body. At the beginning when participant is lying on his back with his eyes open was below the depth of breathing too large values. After the instruction to close your eyes slowly breathing deepened. During the practicing of breathing movement sequence in a kneeling position “Mardjari–Cat” all participants reached high values. The exercise “Mardjari–Cat” was confirmed in all tested participants like deepest breathing, as well as the final breathing in sitting position with voice resonance (chanting "Om"). Just during breathing with chanting Om all participants reached during inhale maximal amplitudes.

In the beginning of the measurements in lying position the heart rate of participants was 60-100 beats/1min. Probably they were nervous. Gradually the heart rate has stabilized at an average of 72 beats/1min. When they changed position and started to provide the exercise “Mardjari – Cat” heart rate decreased. After that when they provided breathing in sitting position with voice resonance (chanting "Om") the heart rate decreased again. The lowest average measured value during exercise was 40 beats/1min. In Figure 3 and 4 are the values recorded during the entire exercise module that panned diaphragmatic breathing. The smallest value was in its infancy during supine with eyes open and then closed. During the exercise, cats diaphragmatic breathing even further while chanting Om is evident deep breath. The average value of diaphragmatic breathing during exercise in all participants was in maximum 15.6 and in minimum 7.11.

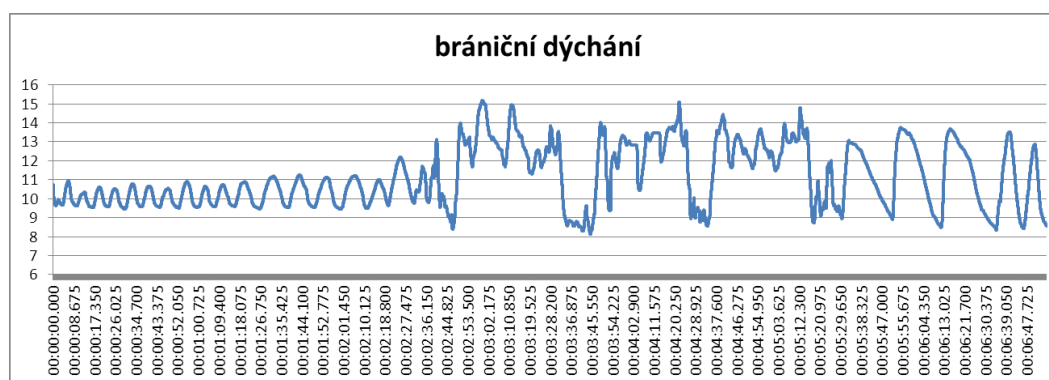


Figure 3 Example of diaphragmatic breathing record in one of participants

In the Figure 3 we can observe that regular diaphragmatic breathing during exercise Cat and chanting Om changed in deepens. The Figures 3 and 4 show that the highest values participants achieved just during the breathing exercise in a kneeling position (Mardjari - Cat) and in the sitting position with voice resonance (chanting "Om"). The mean of peak value was 5.41 cm.

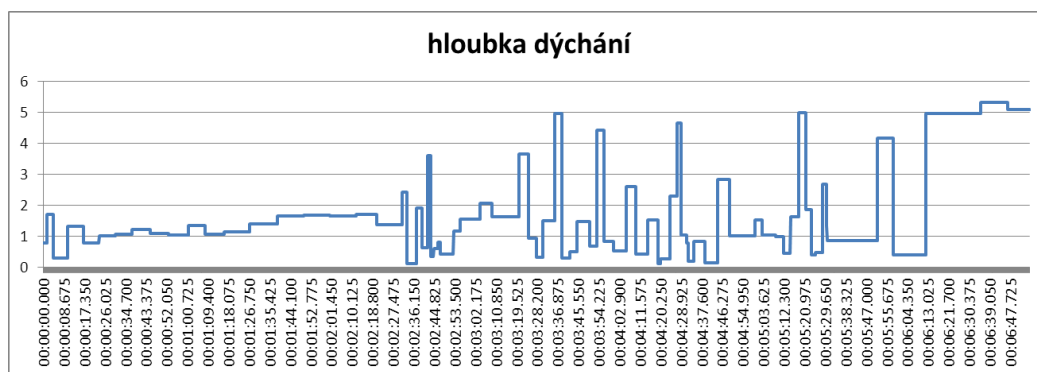


Figure 4 Example of breathing depth record in one of participants

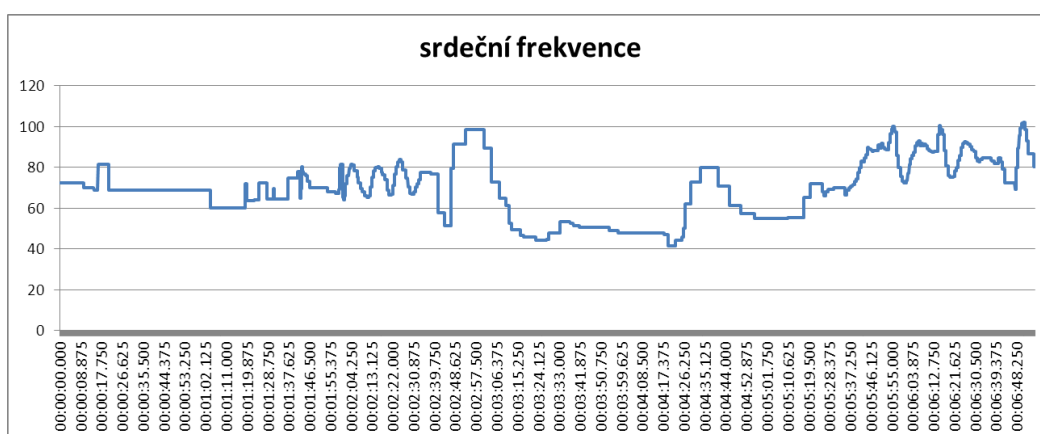


Figure 5 Example of Heart rate record in one of participants

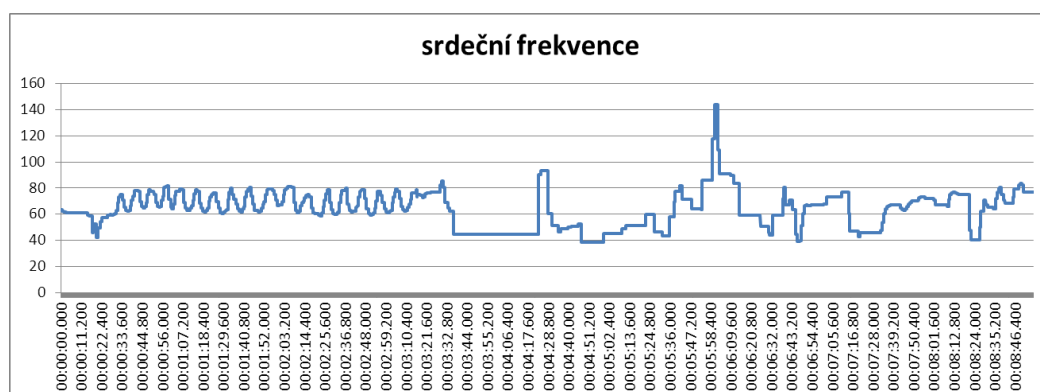


Figure 6 Example of Heart rate record in other of participants

In the Figures 5 and 6 we can observe similarity in recorded heart rate value participants. In both the Figures 5 and 6 is possible to analyse a reduction in heart rate during exercise Cats providing. This marker was repeated in all recorded heart rate in participants.

In normal resting subjects the heart rate is determined mainly by background vagal activity. The basal heart rate is therefore the function of parasympathetic system. In study, there was a significant decrease in basal heart rate in slow breathing group after three months of practice of slow breathing exercise. This indicates that the practice of slow breathing exercise improves vagal activity! It has been suggested that well-performed slow yogic breathing decreases sympathetic activity during altitude induced hypoxia, by increasing oxygenation without altering minute ventilation. In slow and deep breathing, oxygenation of blood increases without changing minute ventilation, as alveolar ventilation increases. It has been suggested earlier that slow breathing increases oxygen consumption that improves autonomic functions. Also slow type of breathing decreases sympathetic activity.

5 Conclusions

After completion of the intervention program was again carried out an expert examination. All participants have acquired full yogic breathing and mastered breath regulation according stress situation. The hypothesis was verified.

The defence and also the prevention adequate physical activity presents. Its intensive impact on peripheral part, it means on somatic system thanks the adequate movement regime is affected psychic condition and physical condition so much that can be absolved stress without any health risk. The base of health support is self-esteem. Predisposition of that is a self-understanding. Predisposition for the self-understanding is ability to relax. The conciseness becomes more objective and wide in the process of self-understanding. Self-understanding has a positive influence on the level of sport performance and skills.

The observed data and the results could serve to further work with youth. Yoga techniques of intervention program can help in various stages of sports training. They can be used not only for relaxation and relaxation, but also for practicing concentration during important matches. Sporting activities rather than focusing only on performance, but responsibly take care of all the components of health, it is imperative that the future will certainly return.

6 References

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