THE DEVICE FOR TRAINING BREATHING OF SWIMMERS USING OF PNEUMA-VIBRATION

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The development of new technologies of preparation of swimmers is one from major problems. The solution of this problem is possible at the expense application of special devices ensuring increase of efficiency of competitive exercise. Majorities of technical devices for preparation of swimmers are used for increase of special fitness of sportsmen. At the same time growth of sports results is possible at the expense of teleological effect on functional systems of an organism of the sportsmen. The device using of pneuma-vibration effect for training a respiratory system of swimmers in real swimming is offered. The offered device allows to increase volume of training work executed by swimmers in a specific space of time for simultaneous growth of adaptive possibilities of a swimmer's organism and to decrease the restoring time after the intensive training work.

KEY WORDS: swimmers, pneuma-vibration, respiratory system, adaptive possibilities

INTRODUCTION: One from major functional systems of an organism of swimmer is respiratory system. The device promoting to development of a respiratory system of swimmers are known at the expense of creation of "additional dead space (ADS)". (Farfel, 1968, 1975; Loffe, 1987; Solopov, 1988).
The ADS creates hypaxial stimulus of development of functionalities of a swimmer organism. Using these devices in training of swimmers promotes the increase of a degree of salving of oxygen (the maximum consumption of oxygen is increased), the adaptation of an organism to conditions of a hypoxia is improved, and there is an additional load on respiratory muscles. Training with ADS devices allows to increase duration of swimming work of a swimmer with an average potency on comparison with training in usual conditions (Farfel, 1975).
The ADS in these devices forms at the expense of a variation of length and radius of a respiratory handset. Defects of these devices are:
- individual features of a swimmer respiratory system are not taken into account;
- these devices can be used on land only.

It's known the condition of breathing of the sportsmen in water essentially differ from conditions of breathing on land. Therefore training effect is obtained by sportsmen on the land can be not realized in water (Solopov, 1988).
It's known from clinical practice that the vibration of the exhaled air stream with frequency 2-32 Hz increases function of salvaging of oxygen and creates an additional load on respiratory muscles (Lindemann, 1992). The optimum frequency of vibration is selected individually depend on a condition of a patient respiratory system. In practice of swimmer's training such devices were not used. The performances of a stream of an exhaled air will depend on a position of a head of a swimmer concerning a line of horizon and individual technique of float. We have assumed that the use of the device creating adjustable hipoxial stimulus of development of functionalities of swimmer organism at the expense of simultaneous creation of respiratory dead space and low-frequency vibration of a stream of an exhaled air allow to increase functionalities of swimmer organism.
The purpose of work – development of the device realizing hypaxial stimulus for teleological effect on swimmer respiratory system in real float.

METHODS: The developed device is executed as a handset for breathing in water (Figure 1). The device fastens in front on a head of swimmer with the help of special strengthening 1 and mouthpiece 2. Load knot 3 is into structure of device too.

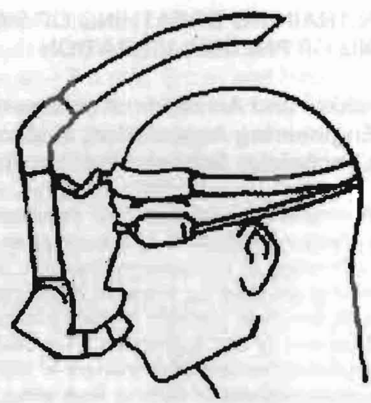

Figure 1 On-position of the offered device (general view).

The load knot contains the channel of an inhalation with the valve and the channel of an exhalation with the generator of low frequency. The generator's construction allows to adjust frequency of vibration of exhaled air stream with allowance for individual features of a swimmer respiratory system and technique of float. The expense of modification of a position of a load knot rather mouth-piece and own individual frequency of vibration is selected by practical consideration at the expense of a modification of a position of a load knot rather mouth-piece and own sensations of sportsman.

Clinical-technical tests of offered device conducted by laboratory of breathing of St.-Petersburg State Medical University have revealed that a range of vibration of an exhaled stream air is 13.8 ± 2.0–24.5 ± 1.0 Hz. The frequency of vibration depends on a flow velocity and pressure of an exhaled air for want of various angles of declination of a load knot rather mouthpiece.

The device was tested in training of elite swimmers of free style (5 men) in exercise 4x300 m in anaerobic mode. The swimmer with the device was floating on the adjacent track with a swimmer without device with the same velocity.

RESULTS: Application of the device:

-increase pulse of the swimmers on the average on group up to 126 impacts/minute (without device – 108 impacts/minute);

-increase a remote velocity at the expense of growth of frequency of movements on the average on group at 11% on a comparison with float without device;

-the velocity of pulse restoring has grown on the average on 47%.

CONCLUSIONS:

1. Device realizing adjusted hypaxial stimulus for teleological effect on respiratory system of a swimmer in real float at the expense of simultaneous creation of respiratory dead space and low frequency vibration of an exhaled air stream was developed.
2. The offered device allows to increase volume of training work executed by swimmers in a specific space of time for simultaneous growth of adaptive possibilities of a swimmer's organism.

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A SIX-WEEK NETBALL JUMP SHOT SHOOTING INTERVENTION CAN IMPROVE NETBALL SHOOTING ACCURACY

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The purpose of this study was to identify if training a netball player to execute a jump shot as an alternative to the traditional standing shot, would result in greater shooting accuracy, for shots taken from a distance of three metres. Three testing occasions were employed, with club-class goal shooters allocated into three groups - experimental (n=6), training control (n=6) and pure control (n=6). Netball shooters underwent a shooting intervention of three sessions (100 shots) per week for six weeks. The six-week training intervention increased shooting accuracy between the three groups at both the mid-intervention and post-intervention. Findings substantiate that a change in shooting technique and the practice variability of the jump shot allowed for the greatest improvement in shooting accuracy.

INTRODUCTION: Netball is a game that demands high levels of speed, strength, power and endurance as well as vision and decision making. However, whilst fitness, motivation and tactical prowess are undoubtedly important attributes in both team play and netball shooting, the accuracy levels of an individual shooter often determine the level of success or failure experienced by the shooter, and therefore the team. Introducing the jump shot into the game of netball seeks to provide shooters with an additional shooting tool when in the outer parameters of the shooting circle, off balance, or as a counteraction against a well-timed jumping defence. A netball jump shot has the potential to be very effective if practised specifically to assist the development of the game.

The introduction of a netball jump shot would enable a shooter to execute a shot, whilst conquering a tactical jumping defensive or a player greater in stature, without the infringement of the rules surrounding the netball shooting movement. Through training, principles such as random practice or contextual interference may be used to enhance the desired training effect (French, et al, 1990; Landin, et al, 1993). Training two different skills with the intent of increasing shooting accuracy, may present some 'negative transfer' within the skill. A negative effect on the outcome may occur primarily because the techniques (jump and standing shooting) may be too similar in nature for some shooters (generally the more accurate) resulting in an interference in the motor learning patterns (Sands and McNeal, 2003). Changing the underlying structure of the movement within each training session would result in the reconstruction of motor control processing required for accuracy. Coaches should, therefore, be aware that shooting accuracy may decrease prior to an increase as a part of the natural motor learning process. Neuro-motor patterns will change with a new or modified technique and therefore time is needed for the trained motor neurons to adjust. The purpose of this study, therefore, was to quantify the effects of a 6-week netball shooting intervention on shooting performance (measured via accuracy) from three meters.

METHODS: Eighteen club netball players (mean age 21.6 $\pm$ 4.3 years, height 172 $\pm$ 4 cm and mass 71 $\pm$ 10 kg) were randomised into three intervention groups of six netball shooters: experimental (50%Jump / 50%Stand); training control (100%Stand); and pure control (0%Training). A digital video camera (Sony PAL 50 Hz) was placed under the goal mouth in a glass case to capture each player's shooting accuracy from a distance of three metres. A specifically designed 1-13 ordinal grid system (See Figure 1) was developed to break down shooting performance into four main categories; 'swoosh' (A); 'hit and success' (B-E); 'hit and unsuccessful' (F-I) and 'missed completely' (J-M) was used to review the performance of each player on the video. The netball shooters underwent a shooting intervention of three sessions per week for six-weeks. All shots were recorded using the accuracy system and shot from the same three meter position. Tests were performed at three separate testing occasions; pre (0 wks), mid (3 wks) and post intervention (6 wks).

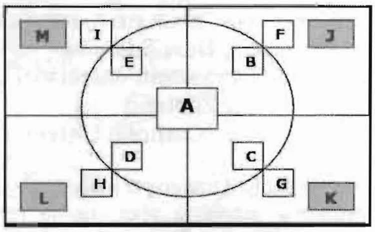


Figure 1 Netball specific ordinal grid (A-M) accuracy system (Henderson, 2004).

Statistical analyses: A least squared regression of the 'goodness of fit' (Hopkins, 2000) was employed to calculate the magnitude of linearity through slope and intercept values. In addition, a repeated measures analysis of variance (ANOVA with repeated measures) was employed through SPSS® to calculate changes in shooting accuracy.

RESULTS: Ordinal grid accuracy data were averaged by training group to provide an indication of overall shooting success (See Table 1). No significant differences in accuracy were found between the groups at the pre-intervention testing occasion. Overall, the standing shot was 24% more accurate than that of the jump shot at the pre-testing occasion (success: 40% standing, 31% jump shot) ($p = 0.03$). At the post testing occasion, the standing shot was 20% more accurate than the jump shot (success: 46% standing, 37% jump shot) ($p = 0.03$). The incidence of the complete missed standing ($p = 0.01$) and jump ($p = 0.04$) shots decreased during the intervention for both training groups. The six-week training intervention amplified shooting accuracy between the three groups at both the mid-intervention (3 wks) and the post-intervention (6 wks).

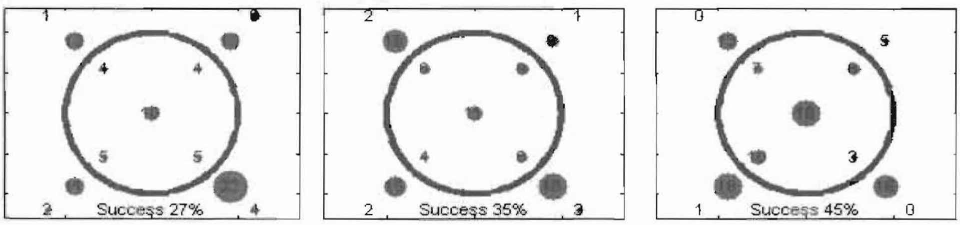
Table 1 Average shooting success percentages at the pre-, mid- and postinter-ventions for the experimental, training control and pure control groups.

Intervention group	Jump or Stand test	0 wks – X ± SD (%)	3 wks – X ± SD (%)	6 wks – X ± SD (%)
50% Jump / 50% Stand	Jump	27.0 ± 6.3	35.3 ± 5.1	45.3± 7.5
50% Jump / 50% Stand	Stand	39.3 ± 9.2	41.0 ± 9.2	50.0 % ± 9.5
100% Stand	Jump	26.0 ± 4.7	29.0 ± 4.5	33.0 % ± 2.8
100% Stand	Stand	31.7 ± 2.3	41.3 ± 4.1	42.3 % ± 3.1
0% Training	Jump	39.3 ± 9.9	42.7 ± 7.1	35.7 % ± 9.1
0% Training	Stand	49.7 ± 9.1	52.7 ± 7.4	50.3 % ± 15.1

Table 2 Predicted change of successful shots over the six week intervention.

Intervention group	Jump or Stand test	Average	SD	Percentage
50%Jump / 50%Stand	Stand	7.00	6.37	14.0
50%Jump / 50%Stand	Jump	5.40	6.84	10.8
100%Stand	Stand	6.56	1.17	13.0
100%Stand	Jump	2.70	4.10	5.4
0%Training	Stand	-0.55	7.22	-1.0
0%Training	Jump	1.31	7.08	2.6

Observable differences in shooting performance between the three groups were evident in both the mid (3 wks) and post-intervention results (6 wks). However, no statistically significant differences were revealed at either the pre-intervention or the mid-intervention testing occasions between all groups using a log transformation predicted slope analysis (extrapolation of results). Table 2 shows the predicted change of successful shots over the six week intervention. The 50% Jump / 50% Stand group had the most prevalent predicted change of 7 standing shots (14%), and 5.4 (10.8%) jump shots over the intervention period.



0 weeks 3 weeks 6 weeks

Figure 2 Example of ordinal grid accuracy of the jump shot for the 50% Jump / 50% Stand training group over the six week shooting intervention. Numbers presented on the graphs are average group percentages.

Figure 2 illustrates the ability to identify the differing points of accuracy / inaccuracy over a six week shooting intervention. These graphical examples illustrate the end point variability changes as a result of the jump shot training intervention - the shooters were able to increase the amount of 'swoosh' shots (from 10% to 18% over the six weeks) and decrease the amount of shots that missed the hoop completely.

DISCUSSION: Effective changes in standing and jumping shooting accuracy can be observed after three weeks of a standard shooting intervention (100% Stand). Additional changes in accuracy were enhanced when netball shooters used the jump shot training intervention (50%Jump / 50%Stand). The jump shot shooting intervention was capable of producing the biggest accuracy benefits in both high and low accuracy shooters. These findings corroborate that the practice variability of the jump shot allowed for the greatest improvement in shooting accuracy over a six week shooting period. This would indicate that the retention of netball shooting is enhanced when athletes train in an environment, which prevents them from simply repeating the same movement pattern which is specific to that used in a game situation. Interference methods, such as jump shooting, force the netball shooter to engage in more meaningful processing or the regeneration of motor skills (Farrow and Maschette, 1997). Overall enhanced skill acquisition may be observed after prolonged exposure to the new skill of jump shooting during random practice. In the 50% Jump / 50% Stand group, 'negative transfer' was observed as a result of the new technique, the jump shot, interfering with the traditional standing shot movement pattern during the initial training sessions over the first three weeks. The movement pattern for the established shooting technique, however, stabilised within six weeks and, furthermore, the accuracy of this technique was enhanced.

End point movement variation was reduced at the mid-testing occasion, that is, three weeks of training was required before improvements in standing shot performance could be observed. Supporting these observations, standing and jump shot performance did not improve throughout the intervention period for the pure control (no training) group. Therefore, it appears that three weeks of random practice is generally sufficient for the movement patterns of the existing and new skills to stabilise, and six weeks for performance improvements to be observed irrespective of previous performance levels (accuracy level). It is important, however, for the coach to be responsive to possible observations of "bad habits' or "lousy technique" during this phase, as this may be an incidence of contextual interference (Sands, McNeal et al., 2003). Further research is warranted to investigate this topic with

different levels of netball shooters and different time frames. Training interventions longer than six-weeks may be preferred to identify further increases in accuracy.
Results of the current study generally (but not entirely) supported the view that variability of practice enhances performance. Most studies (Catalano and Kleiner, 1984; Lee, Magill et al.,1985; Newell and Shapiro, 1976) report results endorsing the variability of practice theory. However, a small number of studies (Johnson and McCabe, 1982; Zelaznik, 1996), have indicated that the variability of practice theory did not provide a transfer of learning but rather was seen as a detriment to performance.
Performance variably or incorrect technique may also result from an inappropriate combination of the kinematic chain, due to a small change in the movement of one part (Miller, 2000). In netball shooting, for example, if the main body (lower legs and trunk) moves prior to shoulder and elbow extension, the endpoint velocity of the movement is compromised. Further analysis of other variables (kinematics, anthropometry and leg and chest power) investigated alongside this accuracy data has been reported elsewhere (Henderson, 2004). Kinematic variables included; ankle, knee, hip, trunk, shoulder, elbow, wrist and the timing of four shooting phases (preparation; crouch; execution; follow through).
Additionally of interest is the predominant percentage of inaccurate shots hitting the front right hand side of the netball hoop. The accuracy grid provides coaches or trainers with the ability to observe successful or unsuccessful shooting patterns in relation to the hoop. For example, the grid information from Figure 2 may suggest to a coach that these particular netball shooters are shooting with an incorrect elbow position or inadequate knee flexion.

CONCLUSIONS: Overall, variable shooting practice improved both standing and jump shooting accuracy in club-class netball players, in comparison to the training of the standing shot in isolation. As shooting accuracy increased so did the ability to maintain accuracy with a decrease in end point variability. Coaches should be aware when teaching new or adjusting old motor skills, shooters need at least three weeks to adjust to the new skill and improve shooting accuracy from a distance of three metres. This time frame will allow for any negative transfer effects to dissipate in high accuracy netball shooters.

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