

VISUAL TRAINING PROGRAMME APPLIED TO PRECISION SHOOTING

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INTRODUCTION:

The demands placed on the visual system during the athletic performance are among the most rigorous of any activity.

Because vision influences the capacity of the athlete to perform the tasks of a sport, scientific research has been conducted to investigate the links between skill and vision.

Current literature in the area of sports vision shows that:

- 1 Athletes have better visual abilities than non-athletes.^{1,2,3,4,5,6}
- 2 Visual abilities can be enhanced through visual training.^{8,9,10}
- 3 A few studies have shown that enhanced visual skills can be transferred to better performance in sports.^{2,7,11}

With reference to the last question, it is necessary to consider the difficulties to develop qualitative scientific research since sports performance depends on so many variables too hard to control.

Particularly in shooting, one of the first scientific references we came across are the studies of Hamilton¹². He designed a visual training programme based on audiovisual games. He found significant improvements in performance. More recently, De Teresa⁷ used auditory biofeedback to train experienced shooters. She found significant improvements in visual acuity, and accommodative facility, as well as in shooting performance.

We have conducted a experimental study involving experienced pistol shooters. In our study we tried to control for external variables related to sports performance, that is physical and psychological condition, as well as technique. Thus, we were able to observe the effects of a visual training programme in sports performance.

HYPOTHESES:

The purpose of this study was to observe the relationships among the following variables:

- Visual training in experienced shooters and performance in precision shooting.
- With reference to the Hypothesis formulation, we wanted to find out whether:
- Visual training and specific visual skills improvement in experienced shooters increases the precision of shooting performance.

METHODOLOGY:

PARTICIPANTS:

To do this study we counted on the collaboration of the members of the Catalan Government Special Intervention Squad (Mossos d'Esquadra).

***Sampling Selection:**

- a. Our subjects had at least two years of experience.
- b. They followed a regular programme of training in shooting.
- c. They had a minimal annual shooting average of 7.5.

***Characteristics of the sample:**

- a. Average age: 29 years
- b. Shooting training sessions per week: 6 hours.
- c. With reference to the visual system, our sample had an initial valuation of *normal*.

MATERIALS:

To develop this project we used: Refraction Unit ESSILOR, Vector Vision CSV 1000, Computerized field analyser Humphrey 2000, Visual therapy material, Farnsworth-Munsell 100 color test, balance board, pistols, chronometers.

SERVICE FACILITIES:

*Sports Vision Center at the High Sportive Performance Center (C.A.R. of Sant Cugat, Barcelona).

*A laboratory of Optometric research. Politechnical University of Catalonia.

*A Shooting gallery of "Mossos d'Esquadra".

PROCEDURES

A. PRE-TEST:

At the previous control we collected data on the following exams:

1. Evaluation of visual function:

Integrity of visual field, Ophthalmoscopy and biomicroscopy, Analytical visual exam of the O.E.P.

1.2. Visual variables selected:

To evaluate the visual function, we selected 12 variables: Static Visual acuities, Habitual lateral phoria at distance and at near, Base out and Base in vergency reserves at distance and at near, Analytical amplitudes, Positive and negative relative accommodation, Near point of convergence, Accommodative facility at distance and at near, Distance-near saccadic binocular fixations, Speed of stereopsis at near, Contrast sensivity function, Color vision test.

Pre-test data were taken once our subjects wore the best optical neutralization.

2. Evaluation of the physical condition.

We selected 4 variables: strength, endurance, speed and flexibility.

3. Control & determination of psychological abilities:

Anxiety S.T.A.I. (A-R) test.

4. Collecting the shooting scores means throughout the '92 year.

(Data gathered the previous year to the investigation).

B. DEVELOPMENT OF THE PROGRAMME:

1.Design and development of a specific visual training programme for shooting.

*Length of time: 71 days

*Sessions: 22 clinical and 27 individual

*Time of each clinical session: 30 to 40 minutes

*Time of each home training session: 10 to 15 minutes.

2.Control of shooting scores.

3.Subjctive control of visual function.

C. POST-TEST:

1.Evaluation of physical condition.

The pre-test protocol is repeated.

2.Control and determination of psychological abilities.

The pre-test protocol is repeated.

3.Control and evaluation of the visual function after the training.

The pre-test protocol is repeated.

4.Assessment of the results obtained in shooting during the four months of visual training (January, Febrery, March and half April).

5.Control of the shooting results the three months after concluding the programme.

RESULTS:

SHOOTING SCORES MEANS:
 PRE-TEST, POST-TEST, THREE MONTHS AFTER THE
 TRAINING AND RELATIVE IMPROVEMENT.

SUBJECT	PRE-TEST	POST TEST	AFTER	R.I.%
1	8.60	9.09	8.28	35
2	7.87	8.82	7.98	44
3	8.20	8.63	8.54	23.8
4	8.52	9.15	8.50	42.56
5	8.69	9.20	8.56	38.93
6	7.85	8.99	7.80	53.02
7	8.20	9.08	7.31	48.88
8	8.33	8.95	7.88	37.12
9	7.90	8.71	7.89	38.57
10	9.04	9.36	8.75	33.33
11	7.75	8.99	7.45	55.11
GROUP MEAN	8.26	9.00	8.08	40.94
SD	0.41	0.21	0.42	

table 1

t=-8.19 p=0.000

VISUAL VARIABLES

	PRE-TEST (X)	SD	POST- TEST (X)	SD
VAFD	1.26	0.25	1.39	0.15
VAFND	1.15	0.26	1.33	0.21
HLPD	-1.09	2.72	0.68	1.45
BIVRF	4.30	1.16	5.80	0.42
BOVRF	7.27	3.07	12.00	2.63
AAB	-4.98	1.13	-6.16	0.67
NRA	2.61	0.55	3.25	0.69
AFND	9.54	6.64	18.45	7.30
AFNND	6.73	6.83	19.82	7.73
AFNB	7.82	3.82	16.45	3.92
AFDD	10.09	5.24	14.54	4.69
AFAND	8.27	5.25	14.00	3.29
AFDB	7.73	4.84	13.18	5.93
SFB	24.18	4.04	32.09	4.35

table 3

- VAFD : Visual Acuity at distance. Dominant eye.
 VAFND: Visual Acuity at distance. Non Dominant eye.
 HLPD : Habitual Lateral Phoria at Distance.
 BIVRF: Base In Vergency (Recovery point) at distance.
 BOVRF: Base Out Vergency (Recovery point) at distance.
 AAB : Analytical Amplitude Binocular.
 NRA : Negative Relative Accommodation.
 AFND : Accommodative Facility at Near. Dominant eye.
 AFNND: Accommodative Facility at Near. Non Dominant eye.
 AFNB : Accommodative Facility at Near. Binocular.
 AFDD : Accommodative Facility at Distance. Dominant eye.
 AFDND: Accommodative Facility at Distance. Non Dominant eye.
 AFDB : Accommodative Facility at Distance. Binocular.
 SFB: Saccadic Fixations. Binocular.

CONCLUSIONS:

- 1.The results showed us statistically significant gains in precision shooting.
- 2.The results showed greater individual regularity in shooting, as well as homogenization of the sample scores.
- 3.When the visual training programme was over, a progressive decrease of the shooting performance was observed.
- 4.The specific visual training programme has improved the visual function of every subject of the sample.
- 5.Since we didn't find significant differences between pre-test and post-test levels of physical and psychological condition, we assume that these variables have not contributed to the witnessed improvement on shooting performance.

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APPENDIX A:

***PHASE A:** (Monocular)

8 in office sessions and 11 at home

In office:

First Session:

- light stimulation (Revien,1981)
- mental minus (Sanet,1993)
- Hart Chart (5 meter)

Second Session:

- light stimulation
- Hart Chart (5 meter)
- Hart Chart (40 centimeter)

Third Session:

- light stimulation
- mental minus

Forth Session:

- light stimulation
- Hart Chart modified on a Bull's Eye (5 meter).

Fifth Session:

- light stimulation
- mental minus with Hart Chart modified on a Bull's Eye (5 meter) .
- Visualization of aiming action (Palmi, 1991)

Sixth Session:

- light stimulation
- Hart Chart accommodative rock
- mental minus with Hart Chart modified on a Bull's Eye (5 meter)

Seventh Session:

- light stimulation
- Hart Chart accommodative rock.
- mental minus with Hart Chart modified on a Bull's Eye (5 meter)
- Visualization of aiming action with metronome

Eighth Session:

- light stimulation
- Hart Chart accommodative rock.
- mental minus with Hart Chart modified on a Bull's

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Eye (5 meter)

At home:

- Bull's Eye (Bernell)
- Hart Chart at near

***PHASE B:** (Binocular)

8 in office sessions and 6 at home

In office:

First Session:

- flippers at distance
- flippers at near
- Van Order Star at distance

Second Session:

- flippers at distance
- Brock String
- flippers at near

Third Session:

- Brock string
- mental minus
- Van Order Star at distance
- Visualization of aiming action

Forth Session:

- flippers at distance with metronome
- Brock String with metronome
- flippers at near with metronome
- Marsden Ball

Fifth Session:

- flippers at distance with metronome
- flippers at near with metronome
- Vectograms

Sixth Session:

- Marsden Ball
- Visualization of aiming action
- Van Order Star at distance. Metronome and Balance board
- Hart Chart accommodative Rock. Metronome and Balance board

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Seventh Session:

- flippers at distance with metronome
- flippers at near with metronome
- Vectograms
- Brock string with metronome and balance board

Eighth Session:

- flippers at distance with metronome
- Marsden Ball
- Vectograms
- Visualization of aiming action

At home: -light stimulation

***PHASE C:** (Specific for shooting eye)

6 in office sessions and 10 at home

In office:

First Session:

- Saccades with pistol
- Vectograms
- flippers at near

Second Session:

- flippers at distance and at near
- Saccades with pistol

Third Session:

- Saccades with pistol and metronome
- Marsden Ball with pistol

Forth Session:

- Saccades with pistol and metronome
- Marsden Ball with pistol
- Vectograms
- Break Down the shooting action

Fifth Session:

- Saccades with pistol and metronome
- Vectograms

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- "Separate" the shooting action
- flippers at distance with metronome
- flippers at near with metronome
- Bull's Eye and Strobe Light

Sixth Session:

- Saccades with pistol and metronome
- Vectograms
- Break Down the shooting action
- flippers at distance with metronome
- flippers at near with metronome
- Bull's Eye and Strobe Light

At home:

- light stimulation