5-1994

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Abstract

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Degree Type

Thesis

Degree Name

Master of Science in Vision Science

Committee Chair

Willard B. Bleything

Keywords

Special Olympics, visual motor, mental retardation, handicapped, athletic eyewear, sports vision

Subject Categories

Optometry

A Descriptive Study of International Special Olympic Athletes' Vision Care Needs

by

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A thesis submitted to the faculty of the
College of Arts and Sciences
Pacific University
Forest Grove, Oregon
for the degree of
Masters in Education - Visual Function in Learning
May, 1994

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ABSTRACT

Three hundred-seventy International Special Olympics participants and 115 staff members representing 39 countries participated in a vision screening conducted by 32 members of the American Optometric Association's Sports Vision and/or Low Vision Sections during the 1991 International Special Olympics, held in Minneapolis/St. Paul. The program also included emergency eyecare services and educational benefits relating to the role of vision in athletic and life performance. An age-matched population of normal non-athlete students were compared on several measures of visual sensitivity and visual-motor performance. Results of the program substantiated the findings of the 1984-86 Oregon State Special Olympics vision care program. An unmet need for comprehensive eyecare exists within the International Special Olympics population. Areas of greatest concern include the large number of competitors never having received vision care, nearly 1/3 of the athletes participate with uncompensated or residual refractive error, and the increased risk of ocular trauma resulting from lack of eye protection requirements.

KEY WORDS

Special Olympics, visual motor, mental retardation, handicapped, athletic eyewear, sports vision, vision screening

INTRODUCTION

"Let me win. But if I cannot win, let me be brave in the attempt."

This Special Olympics oath was echoed by over 6,000 athletes at the International Special Olympics in Minneapolis/St. Paul, July 1991. The International Special Olympics is an extravagant athletic event designed for athletes with mental retardation. [a] The event is held once every two years, alternating between summer and winter Games. The summer event includes sixteen sports ranging from the common, swimming and volleyball, to the more unusual, table tennis and bocce. This past summer the event drew athletes, spectators and media personnel from over ninety countries. It was the largest athletic event in the world for 1991. [1]

The concept of Special Olympics began in 1963 when Eunice Kennedy Shriver started a day camp for children with mental retardation. This camp emphasized physical activities and soon became a model for similar camps throughout the country. For the first time, it became evident that people with mental retardation benefit from physical activity by gaining confidence and a more positive self-image. The concept of international competition sprouted from the need to give the athletes a goal toward which to work. [2]

The first International Special Olympics was held in 1968 at Soldier Field in Chicago, Illinois. With 1000 athletes from 26 states and Canada, this first competition proved to the world that individuals with mental retardation could rise to a challenge and succeed. Sponsored by the Joseph Kennedy Jr. Foundation, Special Olympics has grown quickly to include local and state competitions in all fifty states as well as in over ninety countries. [1] It is now the second largest sports organization in the world with approximately one million participants worldwide: 475,000 in the United States and 510,000 outside the States. One hundred sixty countries have summer game programs and 35 provide competition in the winter sports. [b] In 1988 Special

Olympics was formally recognized by the International Olympic Committee (IOC). Special Olympics is the only sports organization authorized by the IOC to use the term "Olympics".

To qualify to compete in the International Games an athlete must work his or her way through local, area, sectional and chapter competitions. He or she must also participate in training programs that occur prior to every competition. Many athletes train year-round. It is during training that the athletes develop skills, improve fitness levels and form close relationships to teammates and volunteer coaches. [3]

Athletes are eligible to participate in Special Olympics if they are at least eight years old and 1) have been identified by an agency or professional as having mental retardation, or 2) have a cognitive delay--IQ score of eighty or below, or 3) have significant learning or vocational problems due to intellectual impairment which requires or has required specially-designed instruction (e.g.. remedial instruction). The condition is quite prevalent. In the United States more than six million people can be classified as having mental retardation. That is to say, one of every ten Americans has a family member with some degree of the condition. [4] Worldwide, 250 million people are affected with mental retardation. [5]

Special Olympics is based on the philosophy that people with mental retardation will learn, enjoy and benefit from organized sports. It is hoped that consistent training will help these individuals develop sports skills and that competitions will allow them to measure their own progress with others of equal ability. It is also believed that involvement by family and community members in the sports training and competitions will strengthen family relations and community understanding; and that it will foster equality, respect and acceptance for individuals with mental retardation. [3] This involvement is demonstrated by more than 500,000 individuals in 20,000 communities throughout the world who volunteer their time to this effort. No other sports organization in the world has so many volunteers. [5]

For optometrists the natural concern for these athletes is their vision care needs. Visual impairment occurs with various diseases or conditions that are prevalent in the handicapped population. These include cerebral palsy, epilepsy, multiple sclerosis, diabetes, retinitis pigmentosa, retrolental fibroplasia (RLF), syphilis, rubella, and craniofacial abnormalities. [6,7,8] Past observations indicate basic vision care needs are not being fully addressed. An observation survey performed in 1984 noted that of 74 athletes competing in basketball, nordic skiing, and alpine skiing at the 1984 Oregon Special Olympics, " 72% did not have any type of sunfilter nor goggle and of those athletes wearing spectacle correction (15%), none had protective athletic eyewear. " [9] A 1986 study by Reichow and Stern shows a lack of consistent vision care services, and eye protection/safety policies at the local, regional, and national levels of Special Olympic competition. [9] Presently, the registration form used by Special Olympics has one line concerning vision: "Glasses: Yes/No; Contacts: Yes/No; Lens prescription copy requested".

In addition to this information specific to the Special Olympic population, the National Society to Prevent Blindness (NSPB) computes statistics using the entire American population. The NSPB estimated more than 70,000 sports-related ocular injuries occurred annually in the early 1980's. [10,11] The same group estimated that 37,005 sports and recreational product-related eye injuries were treated in hospital emergency rooms in 1990. This figure is limited to reported product-related injuries treated in hospital emergency rooms. If information on all medically treated injuries was available the NSPB believes the true number of sports and recreational eye injuries could be two or more times greater. [12]

In 1990 the sports with highest eye injury frequency were: basketball with 20.8% of all sports-related injuries, and the baseball sports with 17.3%. The sport activities which account for the most injuries by age group include: [12]

5-14 year olds	Baseball 20.9%, basketball 13.1%
15-24 year olds	Basketball 32.1%, baseball 17.3%
25-64 year olds	Basketball 22%, baseball 14.4%

Both basketball and baseball are competitive events within the Special Olympics Program.

Experts believe that athletes could prevent 90% of those injuries by wearing appropriate protective eyewear. [12] These numbers clearly indicate that all athletes who participate in sports with risk for eye injuries should wear protective eyewear.

The purpose of this study was to determine if there exists an unmet need for vision care services to the International Special Olympics population. For the purposes of this study vision care included optometric and medical history; visual acuity; refractive and ocular health assessments; visual performance screenings; and provision of refractive error correction and protective/corrective athletic eyewear when indicated.

METHODS

Thirty-two optometrists from North America, all members of the American Optometric Association's Sports Vision and/or Low Vision Sections, staffed a three day vision care program provided for the competitors and support staff during the 1991 International Special Olympics, held July 19-27 in Minneapolis/St. Paul, Minnesota. The vision care program, situated in the Olympic Village tent city, consisted of emergency care services, a comprehensive vision screening, educational opportunities addressing the role of vision in athletic and life performance, and sports competition observations to document the utilization of athletic protective eyewear.

Emergency services consisted of repair or replacement of broken eyewear, referral for appropriate care in instances of eye injury or pathology, and on a limited basis, referral for comprehensive vision examinations and prescription services.

The comprehensive vision screening consisted of a modified Pacific Sports Visual Performance Profile (PSVPP), a standardized sports vision assessment battery developed by Dr's. Bradley Coffey and Alan W. Reichow. [13] Protocol for all tests were made available to all screeners upon arrival at the facility. (Appendix One) A briefing was held to insure practitioner knowledge and compliance. The modified battery consisted of case history, 17 core vision tests, several optional tests, and a post-screening consult station.

The case history form addressed such issues as previous vision care history, whether the athlete wears contact lenses or spectacles, present visual complaints, and history of head trauma, or injury, surgery, infection or disease involving the eyes. (Appendix Two)

The modified PSVPP assessed static visual acuity with the Mentor B-VAT; dynamic visual acuity with the Kirschner Rotator; subjective eye movements; refractive condition with the Canon RK-2; depth perception with the Randot Stereo Fly; eye teaming with cover test (40 cm and 6m); near point of convergence; central eye-hand and eye-foot reaction/response times with the Reaction+Plus; eye-hand coordination with the Wayne Saccadic Fixator; and eye-body coordination with the Wayne Saccadic Fixator incorporating the balance attachment. Definitions for each of the above tests are presented in Appendix Four. A 3-ply NCR copy of the screening form was utilized. (Appendix Three) Upon completion of the screening one copy was sent with the athlete, a copy retained for Special Olympics' use, and one placed on file with the Sports Vision Section of the American Optometric Association.

A Vision Evaluation Categories definition document was attached to the evaluation form. (Appendix Four) This form summarized the testing performed and provided definitions for the visual skills evaluated. This is particularly helpful for those eyecare practitioners who would provide follow-up services to the athletes, but may be unfamiliar with certain assessment techniques.

Upon completion of the screening the Olympian and his/her staff member (if available) was briefed on the results, given a copy of the screening results with the Vision Evaluation Categories form attached, and then received a Bausch and Lomb Olympic pin and fanny pack.

Seven members of the vision care team observed Olympians competing in 5 different sports over the three days to assess the quantity and quality of eyewear being worn. When possible the observers sought comments from team staff members.

For comparison purposes a population of similarly aged non-athlete subjects were evaluated on the PSVPP in 1988 by Malmanger and Visher. [14] By definition these individuals were not associated with a professional, high school or collegiate sports team, and did not participate in a sport activity more than two times per week. As with the Olympians these subjects wore the spectacle or contact lens prescription used in recreational pursuits.

RESULTS

Three hundred seventy athletes [134 females (36%) and 236 males (64%)] and 115 coaches, officials and delegates (staff) from 39 countries were screened during the three days of testing. (Table I) The mean age of the Olympians was 21.06 years (range 8-53). One hundred forty three non-athlete students [56 females (39%) and 87 males (61%)] with a mean age of 21.62 years (range 14-39) served as the comparison group. (Table II)

Ten (Soviet) athletes (3.7%) were referred for contact lens fitting, four cases (1%) of active anterior segment pathology were identified, and 39 strabismic athletes (11%) were found.

Case history indicated that 149 of the 370 athletes (40%) had never received a vision examination. Of the 111 (30%) athletes wearing a habitual sports correction, 106 (95%) of the corrections were in spectacle form while only 5 (5%) were contact lenses. Of those wearing a visual correction all were streetwear design. No athletes completing the screening were wearing athletic eyewear for sports participation. The case histories also elicited 39 (11%) Olympians with history of head trauma or eye surgery, infection or injury. (Table III)

Refractive testing revealed 61 (16.5%) athletes with a refractive condition (if no habitual Rx worn) or residual refractive condition (if habitual sports Rx worn) of greater than or equal to -0.75 D. Eleven (3%) athletes tested at greater than or equal to +1.50 D hyperopia, and 116 (31.4%) measured 1.00 D or more of astigmatism. Overall, 116 (31.4%) were performing with or without a vision correction in an ametropic capacity by these criteria. (Table IV)

The athletes demonstrated a mean 6 meter static visual acuity of approximately 20/29 for each eye alone with 20/24 binocular acuity. The student group results were better with monocular acuities of approximately 20/21 right eye, 20/20 left eye and 20/18 both eyes ($p<.001$). (Table V)

Dynamic and reactive visual testing indicated athlete visual and visual motor performance less than the student non-athletes at the $p<.0001$ level for all the following: mean dynamic visual acuity (31.80 versus 44.32 rpm); mean eye-hand reaction (453.4 versus 243.3 msec) and response (768.8 versus 440.7 msec); mean eye-foot reaction (449.2 versus 262.1 msec) and response (835.1 versus 414.5 msec); mean eye-hand coordination (24.15 versus 45.83 touches); and mean eye-body coordination (16.54 versus 28.25 body shifts). (Table V)

Stereopsis tests indicated 72 (19.4 %) of the athletes were participating with no measurable stereopsis.

Three hundred thirty-six Olympians competing in the sports of softball, basketball, roller skating, aquatics, and team handball were observed for eyewear utilization. Of the fifty-nine (18%) who wore eyewear, 51 (86%) were wearing street eyewear. Eight (2%) of all competitors wore athletic corrective and/or protective eyewear. Of the 59 wearing eyewear, only 8 (14%) incorporated the use of sports straps, a device which enhances the stability of the eyewear under the dynamics of sport. (Table VI)

DISCUSSION

The 1991 International Special Olympics Vision Care Program provided services of value to the competitors and support staff, revealed an unmet need in comprehensive vision services for this population, and identified a serious risk to the visual welfare of the Special Olympic Participant.

Numerous broken or non-adjusted frames were presented for repair, adjustment or replacement during the three days of operation. As the Center became more visible the athlete/staff traffic seeking a variety of vision care services increased. Throughout most hours of operation athletes, coaches, officials and delegates were delayed at the entry point due to the interest in the program.

In order to demonstrate a need for basic vision care among the Special Olympic population particular data points must be examined. Lack of prior vision care was apparent through case history revealing 40% of the athletes with no prior vision care. As citizens more prone to various health conditions associated with mental retardation, this is a concern. In such a high risk

population yearly eye exams should be a regular part of the primary health care for each athlete.

Coupled with the large number of athletes with no history of vision examination are the startling numbers relating to visual acuity and refractive error. Several athletes presented with habitual sports visual acuities as poor as 20/400 and over 30% compete with uncompensated refractive or residual refractive conditions of myopia (nearsightedness), hyperopia (farsightedness), or astigmatism. Considering there are approximately 1 million Special Olympics participants worldwide, an estimate of 400,000 have never had a vision examination and over 300,000 are competing with an uncompensated refractive condition, most often correctable.

It might be assumed that the 1991 International Special Olympics population, a group which has progressed through a selection process, is not an accurate representation of the 1 million other Special Olympians worldwide. The percentage and resultant number of Special Olympic athletes without previous vision care, with defective visual acuities, and with uncorrected refractive error may be far greater.

One might also hypothesize that blurry and/or sub-normal visual performance is neither advantageous nor safe. The standard deviations of the measures of visual performance (Table IV) indicate the large variability of the data for the Special Olympian population. Clarity of sight, either in a static or dynamic (athlete or target movement relative to one another) state; visually guided hand and foot reaction (quickness) or response (over-all speed) measures; and gross and fine motor coordination; indicate significantly lower performance in this population. These results suggest that this population may be at even greater risk for ocular trauma than the normal population both in daily life performance sport performance. Observation of athletic competition further supported this concern. As example, there was marked flailing of hands and

arms when defending in basketball. An additional finding which may hinder skill and safety is the fact that 19.4% of the athletes were participating in their respective sport with no measurable stereopsis.

As presented in the introduction, according to the National Society to Prevent Blindness approximately 90% of all eye injuries are preventable. None of the 370 Olympians screened wore any type of approved athletic or safety eyewear. The National Society to Prevent Blindness also documents the most frequent eye injury sports are basketball and the baseball sports. Both sports are represented in Special Olympics competition and were observed for sports eyewear during the International Games. Forty-six (18%) of the athletes participating in those sports wore eyewear, yet only 2 (4%) of those eyewear were athletic protective!

The results of this study indicate a need exists for comprehensive vision care services for the Special Olympics population. Perhaps expanded efforts to involve eyecare practitioners worldwide along with vision education programs through the Special Olympics network , and stricter registration requirements for athletic participation would address this apparent unmet need in the interest and visual welfare of this special population.

Acknowledgments

• The author wishes to thank Dr.'s Willard B. Bleything and Anita McClain, Thesis Advisors; Dr. Bonnie M. Gauer, grant writer; Dr. Nancy Barnard, shipping coordinator; Dr. Robert E. Hersmann, Minnesota liason; and Dr. Bradley Coffey, Ms. Suzanne Scott, Ms. Gina Seymour, Ms. Christina Smith, Mr. Donald Gabel, Mr. Lance Mintle, Mr. John Bass, Mr. Bruce Babcock and Ms. Fran Tabor for their assistance in the project.

• Thanks are also extended to the following companies and associations for loaning instrumentation, providing services or contributing support:

Bausch and Lomb	Canon U.S.A.	Mentor O&O
Minnesota Optometric Assoc.	Minnesota Vikings	Pacific University
Twin City Optical	Wayne Engineering	WR Medical Electronics

• For such a large volunteer event to be a success, tremendous time and financial commitment is required. Special thanks are extended to Bausch and Lomb and the American Optometric Association for their financial support, and to Ms. Eunice Kennedy Shriver, Mr. Sargent Shriver, Mr. Marshall Schwartz, Mr. Roy Smalley and Mr. Irwin Jacobs for their leadership and support of Special Olympics and our program. Finally, we extend our heartfelt thanks to the 6,000 athletes, the support staff, the 34,000 Minnesota volunteers, the Optometric Screening Team Members, and to Mr. Bob Jackson, Special Events Coordinator, Ms. Kate Kagley, Assistant Commissioner, and Mr. Lee Freidman, Assistant Special Events Coordinator, for their exhaustive hours of work in coordinating the many special events of the Games.

a. It should be noted that there may be sensitivity to the term 'mental retardation' however, it is utilized here because it is the standard term used by the International Special Olympics

b. Personal communication with Mr. David Phelps, Office of Public Relations, International Special Olympics. Washington, D.C.

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Table I: Special Olympics Screening Breakdown by Country

Country	Athletes	Female	Male	Staff
Argentina	10	3	7	3
Austria	1	0	1	3
Bahamas	2	1	1	2
Bermuda	3	1	2	1
Bolivia	10	3	7	0
Brazil	6	1	5	1
Cayman Is.	2	1	1	1
Chile	14	6	9	2
Columbia	2	0	2	4
Cuba	9	3	6	4
Czechoslovakia	8	2	6	0
Ecuador	2	0	2	0
England	6	2	4	0
Estonia	3	1	2	0
France	3	1	2	8
Greece	3	0	3	2
Guadeloupe	1	0	1	3
Guam	1	1	0	0
Ireland	6	2	4	1
Jamaica	1	0	1	1
Kenya	1	0	1	1
Mexico	6	2	4	0
Nepal	1	0	1	1
Neklov	1	0	1	0
Nigeria	3	1	2	1
Panama	20	6	15	8
Philippines	1	0	1	1
Puerto Rico	2	0	2	0
Russia	7	3	4	7
Scotland	8	2	6	0
Seychelles	8	3	5	0
Singapore	1	0	1	2
St. Vincent	1	1	0	2
Trinidad	7	3	4	4
USA	171	75	96	43
Venezuela	8	3	5	6
Wales	1	0	1	0
Zimbabwe	25	8	17	3
Total	**370**	**134**	**236**	**115**

Table II: Special Olympian/Student Descriptive Data: Gender/Age

Group	N	Female	%	Male	%	Mean	SD	Range
Olympians	370	134	36%	236	64%	21.06	8.6	8-53
Students	143	56	39%	87	61%	21.62	4.6	14-39

Table III: Special Olympian Visual Performance History

Category	Yes	%	No	%
Prior Vision Examination	221	60%	149	40%
Habitual Sports Rx	111	30%	259	70%
Spectacles	106	29%	264	71%
Contact Lenses	5	1%	365	99%
Athlete's Eye wear	0	0%	370	100%
Eye Surgery, Disease or Injury	39	11%	331	89%

Table IV: Special Olympian Descriptive Data:
Refractive Condition or Residual Refractive Condition*

Condition	N	%
Myopia	61	16.5
Hyperopia	11	3.0
Astigmatism	110	29.7
Ametropia	116	31.4
Emmetropia	254	68.6

**Refractive condition if no habitual sports Rx worn or residual refractive condition if habitual sports Rx worn.*

Table V: Special Olympian/Student Descriptive Data

	Special Olympians			Students			
PSVPP Tested Ability	**Mean**	**SD**	**Range**	**Mean**	**SD**	**Range**	**p-value**
Monocular SVA (Right Eye)*	28.39	24.77	15-300	21.14	7.87	11-63	.0007
Monocular SVA (Left Eye)*	31.08	34.18	15-400	20.23	6.05	11-50	.0002
Binocular SVA*	23.85	14.49	15-100	17.73	4.19	10-42	.0001
Dynamic Visual Acuity (rpm)	31.80	16.82	3.4-69.8	44.32	10.71	21.3-91.0	.0001
Eye-Hand Reaction Speed (msec)	453.4	369.1	186.0-2582.0	243.3	32.6	186.0-384.0	.0001
Eye-Hand Response Speed (msec)	768.8	542.6	330.0-3794.0	440.7	66.4	314.0-654.0	.0001
Eye-Foot Reaction Speed (msec)	449.2	324.0	217.0-3650.0	262.1	28.0	206.0-358.0	.0001
Eye-Foot Response Speed (msec)	835.1	541.9	360.0-5610.0	414.5	54.0	306.0-628.0	.0001
Eye-Hand Coordination	24.15	9.17	2-60	45.83	6.75	30-67	.0001
Eye-Body Coordination	16.54	7.93	1-37	28.25	4.98	20-41	.0001

**Notation: Snellen Denominator*

Table VI: Special Olympics Sports Eye Wear Observation

Sport Observed	Countries or States	Olympians	Eye Wear	% of Athletes w/ Eye Wear	Street Eye Wear	% of all Eye Wear	Athletic Eye Wear	% of all Eye Wear	Eye Wear Sports Straps
Softball	6	85	23	27%	23	100%	0	0%	0
Basketball	14	166	23	14%	21	91%	2	9%	2
Roller Skating	7	30	5	17%	5	100%	0	0%	0
Aquatics	unavailable	35	6	17%	0	0%	6	100%	6
Team Handball	2	20	2	10%	2	100%	0	0%	0
Total (5)	**29+**	**336**	**59**	**18%**	**51**	**86%**	**8**	**14%**	**8**

APPENDIX ONE

STATIC VISUAL ACUITY

E: Clarity of vision; visual discrimination ability.
I: Mentor Binocular Video Acuity Tester (BVAT), occluder.
TD: 6 meters (m).
IL: Standard Room Illumination (34-79 footcandles).
P: Sitting relaxed, eye level with screen.
CF: Testing sequence OD, OS, OU. Avoid memorization by having subject call repeated lines backwards.
Turn system on--ON/OFF switch on end of hand controller. The lowest three Snellen lines appear. If patient cannot call the largest line (20/25) press the UP ARROW. One larger line will appear each time that button is pressed. If isolation of a line is needed press SINGLE/MULTIPLE LINE key. Repeated depression of this button toggles between single and multiple lines. If isolation of a character is needed, first isolate a single line, then press the SINGLE/MULTIPLE CHARACTER key. Again pressing this a second time will return to single line.
If letters are not appropriate, press CHILD twice--Tumbling E's appear at 20/25. To change the size of the Tumbling E line press the UP ARROW or the DOWN ARROW. To show three descending lines of Tumbling E's press SINGLE/MULTIPLE SIZE key. The previously outlined functions will also work in this mode. The athletes will have lap cards to aid in response.
A third stimulus option is HOTV. To enter this mode, press CHILD four times. All of the outlined functions will be the same in this mode. Lap cards will be available to aid in response.
IS: For Snellen: "Call out the smallest line of letters that you can." Motivate the athlete to maximum acuity. "Can you call letters on the next lower line?"
For Tumbling E's: "Using this card, show me which way the fingers of the E point."
For HOTV: "Point to the letter you see on the screen."
R: Record the lowest line in which 3 or more letters were correctly identified, using +/- notation (extra/missed letters, eg, $20/15^{-2}$).
N: To be determined by this testing.

DYNAMIC VISUAL ACUITY

E: Visual acuity for a moving target when subject is stationary.
I: Kirschner Rotator, Optical digital tachometer, and projection screen.
TD: 10 feet
IL: Dim room (6-7 footcandles).
P: Standing relaxed.
CF: Head must be held stationary. Test target is a 20/20 Landolt "C" projected at 10 feet (20/40 VA demand). Speed on rotator should be gradually and steadily decreased at a rate of 4-5 rpm/sec from a starting speed of 100 rpm. Diameter of arc of letter rotation must be 55cm.
Initially, show the athlete the 4 orientations of the Landolt "C" opening--up (U), down (D), right (R), and left (L). Be sure the athlete gives the correct responses when showing these four orientations.
IS: Demonstrate slowing the target. "Watch the rotating letter on the screen and call the direction of the opening as soon as you can see it. I'll gradually slow its movement until you can identify it. Follow the letter with your eyes only. Don't move your head. We will do one practice trial." One practice trial and 5 test trials.
R: Record the speed of rotation (to the nearest on rpm) at which the athlete can first correctly identify the orientation of the rotating letter for each of the five trials. Athlete will only be allowed one incorrect guess. If the athlete guesses incorrectly more than once per test trial, stop and start again with new orientation after demanding him/her not to guess. For accuracy of measurement the optical digital tachometer will be utilized for readings. Instructions will be given on site for its use. Also, record the orientation of the "C". Eg. 62/R, 59/L, 65/U, 58/L. 60/U.
N: To be determined by this testing.

EYE/HAND/FOOT PREFERENCE

EYE PREFERENCE

Hand-Over-Hand Method : Demonstrate to the athlete and then assist him/her in proper hand configuration. Arms extended downward in front of athlete, thumbs crossed with the fingers of one hand overlapping those of the other hand at a perpendicular angle (each hand will form an "L" between thumb and fingers). This should form a hole approximately one inch in diameter. Athlete is then instructed to raise the extended arms and sight a distant object through the hole. The eye with which he/she can still see the sighted object when the other is occluded is determined to be the preferred eye. Two trials run, one with right hand over left and one with left over right. Test sequence to be repeated if the first two measures are not in agreement. If at the end of the repeat test sequence the measures are equally split between OD and OS, circle "Mixed".

HAND PREFERENCE

The hand the athlete prefers to throw a ball with.

FOOT PREFERENCE

The foot the athlete prefers to kick a ball with.

CENTRAL VISUAL REACTION AND RESPONSE SPEEDS (EYE-HAND)

E: Visual motor reaction and response time to central visual stimuli based upon visually guided eye-hand motor response (via hand button release and press of lit target button). Reaction time is measured as the elapsed time between onset of stimulus light and press of ("response") light by subject.

I: Reaction Plus dual chronometer reaction/response timer.

TD: Top of instrument 76.5 cm above floor.

IL: Dim room (6-7 footcandles).

P: Standing relaxed with preferred hand depressing reaction button. Preferred hand must be lined up tangent to boundary line with reaction button under flat of hand at base of fingers. Subject's head aligned vertically over target button.

CF: Body, head, hand alignment. Control panel and examiner positioned behind and to the side of subject so control panel is not visible to subject. The delay prior to stimulus onset should be changed before each trial and should be randomly set at one of the following values: 2.0, 2.5, 3.0, 3.5, and 4.0 seconds.

IS: "Which hand is your preferred hand?" (This is the hand with which you prefer to throw a ball.) Adjust instrument to measure performance using preferred hand. "Place your right (or left depending on preference) hand on this button so that your hand lies up against the line without crossing it. The ready light will come on when you have placed your hand on the reaction button. Position yourself with your head over the response button. I will say 'Ready,' and within one to five seconds the response button will light up. Move your hand over and depress the button as quickly as possible. The reaction button should lie under the flat of your hand at the base of your fingers as I will demonstrate. We will give you two practice trials before we start recording." The instrument will initiate the stimulus between two and four seconds after 'Ready' command, based on the delay time previously set. Subject will be given two practice trials. Subject will not be told his/her times during testing sequence.

R: Record both reaction and response times for each of five trials and calculate the means.

N: To be determined by this testing.

CENTRAL VISUAL REACTION AND RESPONSE SPEEDS (EYE-FOOT)

E: Visual motor reaction and response time to central visual stimuli based upon visually guided Eye-foot motor response (via foot pedal release and press in response to a lit stimulus button). Response time is measured as the elapsed time between onset of stimulus light and release of depressed "reaction" foot pedal. Response time is measured as total elapsed time between onset of stimulus light and press of "response" foot pedal by subject.
I: Reaction Plus dual chronometer reaction/response timer with auxiliary foot pedal switches.
TD: Reaction Plus positioned on edge facing subject, 84cm from center of response button to floor. 2.4 m lateral separation between between Reaction Plus and front edge of standard, hard surface library chair. Foot pedal system lies 36 cm in front of chair. Seat of chair is 43.5 cm floor. Anchor chair and foot-pedal system to floor with adhesive tape.
IL: Dim room (6-7 footcandles incident on instrument).
P: Sitting relaxed with preferred foot depressing "reaction" pedal until ready light is lit.
CF: Strict compliance with subject positioning and instructional set. Control panel and examiner positioned behind and to the side of subject so control panel is not visible to subject. The delay prior to stimulus onset should be changed before each trial and should be randomly set at one on the following delay values: 2.0, 2.5, 3.0, 3.5, and 4.0 seconds.
IS: "Place your preferred (the foot you would kick a ball with) on the pedal which correctly corresponds to that foot (if left preferred, left pedal; if right preferred, right pedal). The green lights on the instrument will light up. I will say 'Ready,' and within one to five seconds the button on the left side of the instrument will light up. Move your foot over and depress the other pedal as quickly as possible. We will give you two practice trials before we start recording." The instrument will initiate a stimulus between two and four seconds following the "Ready" command, based on the delay time previously set. Subject will be given two practice trials. Subject will not be told his/her times during testing sequence.
R: Record both reaction and response times for each of five trials and calculate the means.
N: To be determined by this testing.

EYE HAND COORDINATION

E: Visual motor response time to visual stimuli based upon a precise, visually guided motor response (finger press of lighted target button).

I: Wayne Saccadic Fixator (Program code: Press "ENTER 9 3 ENTER")

TD: Dependent upon athlete (see P).

IL: Critical at 6-7 footcandles incident upon instrument and equal across face of instrument. Calibrate with photometer.

P: Standing relaxed with center of instrument at eye level. Distance from instrument should be such that while the subject stands relaxed with arms extended directly in front, the fingertips of both hands touch the face of the instrument.

CF: Check instrument timing calibration and note any errors. Illumination level and test distance are critical. Subjects may either move their eyes to the stimuli, or may gaze to any other desired position at personal discretion. Both trials are to be run for 30 seconds each.

IS: With the Wayne Mode I, the subject is to depress the lighted stimulus buttons as rapidly as possible. For Mode I: "When you see one of the lights turn on, press it quickly using the tips of your fingers. Another light will come on automatically and, again, turn it off by pressing it as quickly as you can. Your task is to turn off as many lights as you can in 30 seconds. You will have a brief practice trial. Ready? Go!" **Two trials with a 15 second practice trial.**

R: Record the value displayed on the digital readout of instrument at the conclusion of each testing trial.

N: To be determined by this testing.

EYE-BODY COORDINATION

E: Visual motor response time to visual directional stimuli based upon a gross motor postural change in a direction related to the visual stimulus: the subject tips an electronically switched balance board to the left, the right, forward or backward in response to visual stimulus lights that appear in direct forward gaze.

I: Wayne Engineering Saccadic Fixator with auxilary Wayne balance board and Control Center Module. (Program Code: Press: "ENTER 9 27 ENTER", Control Module must be set on BALANCE BOARD)

TD: Distance from front of Electronic Balance Board to Saccadic Fixator is 2.44 meters.

IL: Dim Room (6-7 footcandles).

P: Standing, balanced on Electronic Balance Board.

CF: Check instrument timing calibration and note any errors. Illumination level is critical. The eye-body assessment should be run only after the athlete has completed the eye-hand coorination assessment and has become familiar with th instrumentation. Elevation of the Saccadic Fixator should be adjusted so that the center of the face of the instrument is approximately at eye level as the subject stands ready in balance on the Electronic Balance Board. Both trials are to be run for 30 secs.

IS: With the Wayne Saccadic Fixator in balance mode, four stimulus lights (3,6,9 and 12o'clock) are used. The subject must tip the balance board in the direction of the stimulus light (ie, forward for the 12:00, to the right for 3:00, to the rear for 6:00, and to the left for 9:00) in order to score. As in Wayne Mode I, the stimulus light will remain lit until the correct motor response is accomplished. "This time you'll need to tip the balance board to turn off the light. Tip it forward to turn off the top light, tip to the right to turn off the right-hand light, to the left to turn off the left light, and backward to turn off the bottom light. You'll have a brief practice trial first. Ready? Go!" **Two trials with a 15 second practice trial.**

R: Record the value displayed on the digital readout of the instrument in spaces marked Mode II at the conclusion of each testing trial.

N: To be determined by this testing.

APPENDIX TWO

1991 INTERNATIONAL SPECIAL OLYMPICS

Name_____ Age_____Sport(s)_____

Coach_____

Home Address_____

Home Phone _____

Coach and/or athlete, please circle the requested information (items 1-8). If you have questions regarding any of these items please ask for assistance. This evaluation is designed specifically for competitive performance. The purpose is to evaluate the efficiency of several of the visual skills necessary for peak performance. Our goal is to assist the athletes in reaching their potential. Please consider all questions carefully and answer as thoroughly and accurately as possible.

YES NO 1. Have you ever had a complete visual examination by an eye care practitioner?
If yes, when was your most recent eye exam?_____

YES NO 2. Do you wear glasses?
a. If yes, how old are they?_____
b. Do you wear protective athletic eyewear during sport? **yes no**
c. If you do not wear glasses, have you ever had glasses in the past? **yes no**
If yes, when and why did you stop wearing them?_____

_____

d. Have your glasses ever been broken, bent or knocked off during sport? **yes no**
If yes, please describe_____

YES NO 3. Do you presently wear contact lenses?
a. If yes, what type? **soft, rigid, gas perm**
b. If yes, do you wear them during sport? **yes no**
Do you wear them all day? **yes no**
When did you last have them checked by your eye care practitioner?_____
List any problems with your contact lenses_____

_____

c. If you do not wear contact lenses, have you ever had contact lenses in the past? **yes no**
If yes, when and why did you stop wearing them?_____

_____

YES NO 4. Do you ever see blur?
a. If yes, where? **near distance far distance both** How often?_____
If yes, please describe_____

_____

b. During sports? **yes no** How often?_____
If yes, please describe_____

_____

YES NO 5. Do you ever see double?
a. If yes, where? **near distance** **far distance** **both** How often?_____
If yes, please describe_____

b. During sports? **yes** **no** How often?_____
If yes, please describe_____

YES NO 6. Have you ever suffered head injury; or have you ever had injury, surgery, infection or disease involving your eyes? If yes, explain_____

YES NO 7. Are you experiencing any visual difficulties? If yes, please describe_____

8. Further information (List any performance concerns you may have)_____

APPENDIX THREE

1991 International Special Olympics

Name _____

Sport(s): _____

Habitual Sports Rx: Y N Worn Today: Y N

A B I. VISUAL ACUITY

- o Static Distance: OD _____ OS _____ OU _____
  Near: OD _____ OS _____ OU _____
- o Dynamic ___/__, ___/__, ___/__, ___/__, ___/__

A B II. EYE MOVEMENT SKILLS

- o Pursuits (horiz) _____ (vert) _____ (diag) _____

A B III. REFRACTIVE CONDITION

- o Autorefraction OD _____ OS _____
- o Retinoscopy OD _____ OS _____
- o Hab. Sports Rx? Y N OD _____ OS _____
- o Sport Appropriate? Y N Reason _____
- o Condition: Good Fair Poor Reason: _____
- o Lens Material: Plastic/Polycarb Glass
- o Frame Material: Plastic/Polycarb Metal Combination
- o Frame Style: Full Eyewire Rimless / Hinged Hingeless

A B IV. EYE HEALTH/CONTACT LENSES Comments

- o Ophthalmoscopy _____
- o Color Vision _____
- o Anterior Seg/Contact Lenses _____

A B V. DEPTH PERCEPTION/EYE TEAMING

- o Cover Test 6m ___ eso exo ortho ph strab
  40cm ___ eso exo orhto ph strab
- o NPC Bk _____ cm Rec _____ cm
- o Stereo: Fly _____ Animals _____ WIRT _____ Other _____

A B VI. CENTRAL VISUAL REACTION/RESPONSE TIME

- o Preferred Eye OD OS Mixed
- o Reaction Plus (Preferred Hand = ____)
  ____/____, ____/____, ____/____, ____/____, ____/____
- o Reaction Plus (Preferred Foot = ____)
  ____/____, ____/____, ____/____, ____/____, ____/____

A B VII. EYE/BODY/HAND COORDINATION

- o Wayne I ____ Wayne II ____

* *

Key: A = Screening results adequate for competitive sport performance.
B = Results reveal a possible limitation to sport performance; follow-up care is indicated.
x = Signifies potentially performance-limiting test result.

Staff Initials: _____

Reichow/Coffey 7/91

APPENDIX FOUR

1991 International Special Olympics

Vision Evaluation Categories

Modified Pacific Sports Visual Performance Profile

The athlete listed on the attached evaluation report form was included in a recent sports vision screening conducted by the Sports Vision Section of the American Optometric Association in cooperation with the International Special Olympics. The results of the screening and appropriate recommendations are listed on the report form.

The screening evaluated eye health and several of those visual skills which are considered by authorities in sports vision to be necessary for maximal athletic performance. Deficiencies indicate a need for further evaluation. The screening is NOT, however, a complete visual case study, nor does passing guarantee that an individual is free from visual deficiencies.

The athlete who passes is NOT LIKELY to be in need of remedial visual care and the one who has a deficiency is LIKELY to need follow-up care. Additionally, because vision changes can occur quite rapidly, a person's visual status should be evaluated at least yearly.

Visual Acuity Static visual acuity refers to clarity of eyesight as tested with a standard Snellen test chart. Visual acuity is tested at 6m and 40cm testing distances. Standard normal visual acuity is referred to as 20/20. If the denominator of the ratio is larger than 20 (eg. 20/30), visual acuity is below standard; if the denominator is less than 20 (eg.20/15), visual acuity is better than standard.
Dynamic visual acuity is a measure of the ability to see detail in a moving target. The measurement is taken with the athlete stationary and the target moving.

Eye Movement Skills Eye movement evaluation will be a subjective test of smooth eye movements which are important in tracking moving objects.

Refractive Condition An automated digital instrument is utilized to screen for nearsightedness, farsightedness, and/or astigmatism. Athletes not wearing glasses or contact lenses will be evaluated for any refractive condition that may be affecting performance. Those athletes presently utilizing glasses or contact lenses will be evaluated to determine the adequacy of their present compensating lenses.

Eye Health/Contact Lenses Several tests related to eye health will be provided. Retinal (internal eye) examinations will be performed for all athletes.

Depth Perception/Eye Teaming Depth perception ability (stereo) related to two-eyed aiming will be assessed. The cover test and near pint of convergence (NPC) will evaluate the accuracy and capability of the eye aiming at various distances and positions of gaze. These skills are critical in the athlete's judgement of distance and speed.

Reichow/Coffey 7/91

Central Visual Reaction/Response Time Refers to measures of visual reaction (rx) and response (rs) times consisting of an accurate hand movement in response to a visual stimulus in the center of the visual field. We define "reaction time" as the time required to mentally determine the presence of visual information and to formulate the motor response. "Response time" is the total time required to process the visual information and complete the motor response sequence. Reaction time relates to overall quickness, while response time relates to overall speed. Preferred eg., hand and foot will be determined for sports related tasks.

Eye/Body/Hand Coordination The Wayne is an instrument for measuring the speed and accuracy of eye-hand coordination. The Wayne instrument will also be utilized to evaluate speed and accuracy of body movements in response to visual information. The visual factors involved in maintaining balance during athletic performance will be tested using a sequence of vision/balance tasks which simulate actual sports performance conditions.