Eyespan performance: Athletes vs non-athletes

Brett G. Mildenberger  
Pacific University

Nicholas P. Wissink  
Pacific University

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Normative data were collected for eye-hand skills of 182 subjects, both athletes and non-athletes, using the Monark America EyeSpan instrument, an eye-hand coordination testing and training device. Athletes ranged in age from 18 to 26 years, and non-athletes from 20 to 36 years. All subjects were tested using two modes of the instrument, a subject controlled mode (mode A) and an instrument controlled mode (mode B). The number of correct visually guided eye-hand responses in 60 seconds were recorded for each mode. Comparing two factors, athleticism and gender to EyeSpan score, the two-way ANOVA showed that the primary factor in determining EyeSpan score was athleticism, the secondary factor was gender. The interaction between athleticism and gender on EyeSpan performance, was only significant in the instrument controlled mode. Athletes performed significantly better compared to non-athletes in both mode A and B (p < .01). Likewise, male athletes and non-athletes, show significantly higher scores than do female athletes and non-athletes (p < .05). No significant differences were found between male football and baseball college athletes, or between female volleyball and softball college athletes.

Degree Type
Thesis

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EYESPAN PERFORMANCE

ATHLETES vs NON-ATHLETES

Presented to:

Alan H. Reichow, O.D.

Pacific University College of Optometry

Authors:

Brett G. Mildenberger
Nicholas P. Missink

Submitted in partial fulfillment of the requirement for the

Doctor of Optometry Degree

Spring 1986

This research was conducted at Pacific University College of
Optometry, Forest Grove, OR. as a thesis project.
Biography of Authors

Brett G. Mildenberger was born May 24, 1962 in Hamilton, Montana where he also attended high school. He then attended college at Montana State University from 1980 to 1983 when he was accepted at Pacific University College of Optometry. At Pacific University he went on to obtain a Bachelor's Degree in Visual Science. Currently, Brett is a student at Pacific University. He is a member of the Student Optometric Association and Beta Sigma Kappa. Future plans include practicing Optometry in the Northwest. A general practice is planned with emphasis on vision training and sports vision.

Nicholas P. Wissink was born August 14, 1961 in Chewelah, Washington. He attended Jenkins High School in the same city. After graduating from high school in 1979 he attended Eastern Washington University in Cheney, Washington and graduated with a Bachelor of Science Degree in Biology. He is currently a student at Pacific University College of Optometry. His future plans include practicing optometry on the west coast with an emphasis in vision therapy and sports vision. He is a member of Beta Sigma Kappa, National Association of Sports Vision, Student Optometric Association, American Optometric Association and the Sports Vision Section of the A.O.A.
Acknowledgments

Both authors wish to extend special thanks to Dr. Alan W. Reichow and Dr. Bradley Coffey for assistance with conducting this research project. Thanks also go to Kurt Blades and Thomas Young for their help in compiling data for the project, and to the coaches, trainers, athletes and students who participated.
Abstract

Normative data were collected for eye-hand skills of 182 subjects, both athletes and non-athletes, using the Monark America EyeSpan instrument, an eye-hand coordination testing and training device. Athletes ranged in age from 18 to 26 years, and non-athletes from 20 to 36 years. All subjects were tested using two modes of the instrument, a subject controlled mode (mode A) and an instrument controlled mode (mode B). The number of correct visually guided eye-hand responses in 60 seconds were recorded for each mode. Comparing two factors, athleticism and gender to EyeSpan score, the two-way ANOVA showed that the primary factor in determining EyeSpan score was athleticism, the secondary factor was gender. The interaction between athleticism and gender on EyeSpan performance, was only significant in the instrument controlled mode. Athletes performed significantly better compared to non-athletes in both mode A and B (p < .01). Likewise, male athletes and non-athletes, show significantly higher scores than do female athletes and non-athletes (p < .05). No significant differences were found between male football and baseball college athletes, or between female volleyball and softball college athletes.

KEY WORDS

Reaction time, Eye-hand coordination, EyeSpan
INTRODUCTION

It is generally felt that eye-hand coordination is an important factor in athletic performance. According to Sherman (1980)\(^4\) visual reaction time, a component of eye-hand coordination, is important, or extremely important, in sixteen of an abbreviated list of 21 sports. Spirduso and Yandell (1981)\(^5\) showed a significant difference between athletes and non-athletes with respect to reaction time, but showed no difference between gender. Blades and Young (1986)\(^2\) showed that eye-hand reaction and response time could be significantly improved by training with the EyeSpan. Since reaction and response times appear to be important in athletics, and have been shown to be influenced by EyeSpan training, normed EyeSpan performance levels are necessary for designing remedial/enhancement training programs for the sports minded patient. The EyeSpan, a common instrument utilized in visual training and sports vision, currently has no published normative data. This study is the initial effort in generating this information.
METHODS

The Monark America EyeSpan (Figure 1) is a 122 cm. square instrument which is wall mounted and is comprised of sixty-four stimulus lights arranged in a radial pattern. These lights also function as response buttons. Within each button is a light, which when lit, can be turned off by simply pressing the button.

Subjects for the research project were taken from the student bodies of Portland State University and Pacific University. The eighty-four athletes, all students at Portland State University, included nineteen females and sixty-five males ranging in age from 18 to 26 years of age. The non-athletes were ninety-eight optometry students at Pacific University, twenty-three females and seventy-five males ranging in age from 20 to 36 years.

Athleticism, the athlete vs non-athlete distinction, was made for all individuals who participated in the research. An athlete was defined as any individual who participated in a sport and was a member of a sports team or organization. A non-athlete was a subject not fitting into the athlete definition.

None of the subjects had prior experience on the Monark America EyeSpan. No subjects were allowed to practice before being tested.

To start the procedure, the subject was placed in standing position in front of the Eyespan. The instrument was adjusted
vertically to eye level using the fixation line on the instrument. Incident illumination on the Eyespan was maintained at six to eight foot-candles.

In the **subject** controlled mode (Mode A), the instrument presents a light stimulus and the subject responds by pushing the lit button. Instantly, another button lights up randomly on the visual display. The sequence continues for a pre-set time period, after which, the instrument stops sequencing the stimulus lights and displays the number of correct responses.

In the instrument controlled mode (Mode B), the Eyespan presents a stimulus for a short pre-set time period (.75 sec. for this study) and automatically shifts to its next random location. This mode continues for a pre-set time period, at which time the total number of correct responses is displayed. A control panel on the side of the instrument controls speed, duration, and trial length.

One 60 sec. Mode A trial followed by one 60 sec. Mode B trial (.75 sec. duration) were run on each subject. The following instructions were given to the subjects prior to testing on the EyeSpan:

1. While standing relaxed, fully extend your arms so that your fingertips touch the EyeSpan directly in front of you. Make sure you can touch the buttons in the corners.

2. I will cue you by saying "ready ... go" as I push the start button.
3. Hit the stimulus buttons as quickly as you can, as they randomly light up on the instrument.

4. Each trial will last for 60 seconds.

Mean, median, standard deviation and range were calculated for both age and test scores for all groups. Athletes were separated by gender and sport. The non-athlete group was broken down into male vs female. Each group was compared using the two-way ANOVA. Individual sport groupings were also compared using the standard t-test for significance at the .05 level.

Using the two-way ANOVA we compared the following groups for significant differences for mode A and B:

1. All athletes vs all non-athletes
2. Male athletes vs male non-athletes
3. Female athletes vs female non-athletes
4. Male athletes vs female athletes
5. Male non-athletes vs female non-athletes

Using the standard t-test we compared the following groups for statistical significance for mode A and B:

1. Football (males) vs Baseball (males)
2. Softball (females) vs Volleyball (female)
RESULTS

For the subject controlled mode (Table 1, Figure 3) using the two-way ANOVA test of variance, a significant difference was found between athletes and non-athletes at the .01 level. We also found a significant difference to exist between all males and all females at the .05 level. Athleticism had a greater impact on score than gender. Athleticism and gender together did not interact significantly to effect the subject controlled score.

In other words, the primary factor determining the score for the subject controlled mode was athleticism. The secondary factor in this mode was gender. We cannot say that an interactive effect exists between gender and athleticism.

For the instrument controlled mode (Table 2, Figure 3), again using the two-way ANOVA test of variance, a significant difference was found between athletes and non-athletes and between males and females (p < .01). An interactive effect between athleticism and gender resulted at the .05 level.

In other words, for the instrument controlled mode, we can infer that the strongest factor influencing Eyespan score was athleticism and not gender, although, gender and athleticism both are significant factors by themselves. We cannot conclusively say whether the athletic factor will overcome the factor of gender, or vice versa. Being athletic was a stronger
indicator of performance than was gender. Still the interactive effect between gender and athleticism was significant but not as strong as the individual factors themselves.

We concluded that the instrument controlled mode (mode B) was a more demanding test than the subject controlled mode (mode A) due to lower scores in the instrument controlled mode. The comparison (Table 3, Figure 3) between the means of athletes (94.3 compared to 80.28), and means of non-athletes (83.66 compared with 65.19), illustrates this point.

The data show (Table 4, Figure 4), by the standard t-test at the .05 level, that no significant difference between either male football players and baseball players, or female softball and volleyball players exists in either test mode.
DISCUSSION

The data collected showed that a significant difference exists between an athlete and a non-athlete for both subject and instrument controlled modes. In both modes, statistically comparing EyeSpan performance to two factors, athleticism was the primary factor and gender the secondary factor determining score for the Monark America EyeSpan.

Only the subject controlled mode revealed an interaction effect between athleticism and gender. This suggests that both gender and athleticism influence a subject's EyeSpan score more than just athleticism or gender alone in the subject controlled mode.

Our study is but the first in a needed series to establish normative data for the Monark America EyeSpan instrument. This study has found a significant difference exists between athletes and non-athletes using the EyeSpan. The data collected gives the sports vision practitioner a good estimate of what a college level athlete's performance should be on the EyeSpan. More data is needed in a wider variety of sports and age categories. The future data will give the practitioner more exacting standards for dealing with both athletes and non-athletes.
### Table 1 Subject Mode two-way ANOVA test of variance

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>F(cv)</th>
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p(SS(r)) < .01 ; p(SS(c)) < .05 ; p(SS(re) < .25

### Table 2 Instrument Mode two-way ANOVA test of variance

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p(SS(r)) < .01 ; p(SS(c)) < .01 ; p(SS(re) < .05
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<tr>
<th></th>
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<th>NON-ATHLETES</th>
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<tr>
<td></td>
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<td>FEMALES ONLY</td>
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<td>65</td>
<td>19</td>
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<td>MODE A MEAN</td>
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<td>77.65</td>
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<td>80.28</td>
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<td>79.02</td>
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<td>53 to 99</td>
<td>18 to 108</td>
<td>18 to 108</td>
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**TABLE 3 ATHLETES vs. NON-ATHLETES**
TABLE 4 COLLEGE LEVEL ATHLETES

<table>
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<tr>
<th>N</th>
<th>FOOTBALL MALE</th>
<th>BASEBALL MALE</th>
<th>SOFTBALL FEMALE</th>
<th>VOLLEYBALL FEMALE</th>
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<tbody>
<tr>
<td>AGE MEAN</td>
<td>20.31</td>
<td>20.04</td>
<td>20.09</td>
<td>19.38</td>
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<tr>
<td>AGE MEDIAN</td>
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<td>20</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
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<td>95.46</td>
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<td>79.48</td>
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<td>12.95</td>
<td>11.56</td>
<td>13.35</td>
<td>11.20</td>
</tr>
</tbody>
</table>
OVERALL GROUP COMPARISONS

FIGURE 2

ATHLETES VS. NON-ATHLETES

FIGURE 3
INTERSPORT COMPARISONS

FIGURE 4
REFERENCES


