
# STANDARDIZATION OF THE Wayne Saccadic Fixator

## (Near-Far-Near and Saccadic Fixation Procedures On 6-13 Year Olds)

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***ABSTRACT***

*A sample of 228 children ranging in age from 6-13 years were administered tests using the computerized Wayne Saccadic Fixator. This study reports the standardized means and standard deviations of the following computerized procedures: near-far-near, visual preaction time and visual reaction time. The results of all procedures were compared by factors of age and sex. With normative data established for the computerized Wayne Saccadic Fixation procedures, the instrument can be more readily used to test specific visual functions.*

***KEY WORDS***

*Wayne Saccadic Fixator, saccadic eye movements, Wayne near-far-near procedure, visual preaction time, visual reaction time, accommodative facility*

Fixation refers to the process of directing the eye toward an object of regard. In the normal eye this causes the image of the object to be centered on the fovea.[1] With saccadic eye movements, an observer shifts his or her gaze from objects already scrutinized to potentially significant targets in the periphery of the visual field.[2] This basic movement directs visual activity.[3,4,5]

Pursuits, vergence and accommodation all depend upon the fixation process. The oculomotor system has been implicated as a component in accommodation, vergence, sensory and perceptual disorders.[6,7] All of these systems rely upon accurate alignment of the eyes in order for efficient visual performance to occur.[8]

In the classroom environment and in sports activities both fixation and accommodative abilities repeatedly interact.[8] This interaction between accommodation and fixation is an elaborate physiological process. Schor et al.[9] expressed this by stating, "accommodative vergence under normal binocular viewing conditions does not work alone but rather in a complex interactive manner with disparity vergence in which related feedback pathways assist in the fine focus and bifoveal fixation of an object of interest." This interaction could be a factor influencing the discrepancy between the oculomotor skills of good and poor athletes or academic achievers.

The prevalence of accommodative and fixation disorders in the school-aged child is well documented.[10,11,12] Sherman[10] evaluated vision in 50 learning-disabled children aged 6-13 years. He discovered focus facility problems in 88% of the children and oculomotor efficiency problems in 96% of these patients. Hoffman[11] evaluated a non-learning disabled sample of children aged 5-14 years; focus facility problems were observed in 44% and 24% of the children showed ocular motor inefficiency. In a comparable sample of learning-disabled children, 83% had a focus facility dysfunction and 94% showed ocular motor inefficiency.[11] The author concluded that there was a higher prevalence of vision problems in the reading-disabled group (for accommodative infacility $p<.001$). Maples and Ficklin have shown that gifted and learning-disabled populations have different oculomotor skills.[13] Their results indi-

cated that the learning disabled failed the tested oculomotor variables twice as often as normal or gifted children in most of the categories they observed. They have recently reported that eye movement skills are better in above average readers when compared to below average readers.[14]

## BACKGROUND ON WAYNE SACCADIC FIXATOR

The Wayne Saccadic Fixator[a] is an instrument commonly used in vision therapy and sports vision.[15,16,17,18] It can be used to evaluate the following visual skills: eye-hand coordination, peripheral vision, near-far-near fixation, visual preaction time and visual reaction time.[15]

The newest model of the Wayne Saccadic Fixator (see Figure 1) is computerized, employing 50 programs stored in its memory.[17] The instrument is a portable rectangular box utilizing numerous lights arranged in a 27-inch diameter circle. These lights can be randomly illuminated according to a pre-set or custom mode.

The general procedure for fixation testing with the Wayne Saccadic Fixator is to have the patient stand at arm's length and centered before the instrument. The height of the center of the instrument is set at the patient's eye level. The patient depresses an illuminated button. Immediately after this is accomplished, another button in a different position is illuminated and the task is repeated. The instrument electronically records the number of correct responses over a specific period of time and provides an auditory feedback to the patient when the correct response is made.

To perform the Wayne near-far-near test, the patient sits 15 feet from the instrument. He depresses the letter on a small control box before him which matches the letter with an illuminated button adjacent to it, on the distant Wayne Saccadic Fixator (see Figure 2). Again, the instrument electronically records the number of correct letters pressed in a specific time period (60 seconds) and provides auditory feedback when a letter is correctly pressed. In the performance of the Wayne fixation and near-far-near procedures, there is multisensory involvement of the visual, auditory, kinesthetic/proprioceptive and tactile senses.

A study by Percival and Guedry[19] on oculomotor efficiency resulted in the conclusion that, "the quantity of information

*Figure 1. Wayne Saccadic Fixator*

extracted from a visual display within a short interval immediately following a gaze shift can be used as a measure of oculomotor efficiency." One can reasonably infer from this statement that the number of correct responses on the saccadic fixation procedures be used to assess oculomotor efficiency.

Sherman[15] has used the Wayne Saccadic Fixator for testing both amateur and professional athletes. A total of 371 athletes were tested for eye-hand coordination, visual preaction time and visual reaction time. Visual preaction time refers to the score obtained when the subject is given as much time as is required to locate and press the button. Visual reaction time, on the other hand, refers to the score obtained when the subject is given only one second to locate and press the button. If the subject is slower than the one second allotted, another light is randomly illuminated and the subject is again given one second to extinguish the light by pressing the appropriate button. This procedure is repeated for the allotted time.

A scoring system was formulated to indicate proficiency in those visual areas. Sherman[15] developed a standardized test score using the visual reaction and visual preaction times. The score was tabulated by dividing the number of buttons pushed during the visual preaction phase into those pushed during the visual reaction phase, then multiplying by 100. Sherman labeled the resultant number the Sports Vision Average (SVA). He proposed that this test can be used to evaluate the visual performance of athletes. Such visual testing is useful to the athlete since visual skills can play an important role in his or her athletic performance.[20,21,22]

Appler and Quimby's study[16] established standards for performance on the Wayne Saccadic Fixator for children in

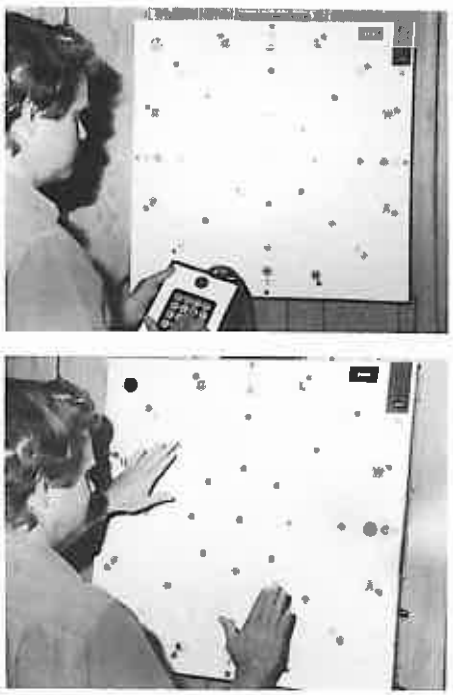

*Figure 2. Patient performing the Wayne near-far-near test*

each of the first five grades of school. While these researchers did not include the near-far-near procedure, they did evaluate eye-hand coordination with the visual preaction and reaction times. They observed, "an increasing level of performance from children ages 6 through 12 years of age." They also established normative data for children and these means and standard deviations are presented in Table 1.

The Appler and Quimby study[16] also demonstrated the importance of controlling ambient room illumination when testing the Wayne Saccadic Fixator. In their study of three school systems, different illumination levels were used. This demonstrated that decreased levels of illumination increased eye-hand coordination performance because of enhanced contrast between the target buttons and the background. Consistent control of illumination is therefore necessary when testing with the Wayne Saccadic Fixator. These researchers recommended that in future studies older children be tested to determine when the age/performance curve peaks.

Christenson and Winkelstein[17] advocated the use of the Wayne Saccadic Fixator in a sports vision testing battery. They deemed the visual reaction time a significant sports-related test in evaluat-

**TABLE 1**
**APPLER & QUIMBY' S[16]**
**PERFORMANCE RESULTS**

**Visual Preaction Time**

| GRADE | | MEAN | SD |
|---|---|---|---|
| I | School #1: | 10.43 | 2.84 |
| | School #2: | 15.12 | 3.57 |
| | School #3: | 16.05 | 3.39 |
| II | School #1: | 12.63 | 2.85 |
| | School #2: | 19.79 | 3.24 |
| | School #3: | 19.71 | 2.73 |
| III | School #1: | 12.87 | 2.63 |
| | School #2: | 22.48 | 2.79 |
| | School #3: | 21.26 | 3.28 |
| IV | School #1: | 18.15 | 5.08 |
| | School #2: | 24.47 | 3.30 |
| | School #3: | 22.13 | 4.11 |
| V | School #l: | --.-- | --.-- |
| | School #2: | 23.29 | 3.47 |
| | School #3: | 26.47 | 3.45 |
| | School A: | 21.00 | 3.44 |
| | School B: | 13.51 | 2.69 |

**Visual Reaction Time**

| GRADE | | MEAN | SD |
|---|---|---|---|
| I | School #1: | 1.84 | 1.72 |
| | School #2: | 1.86 | 1.76 |
| | School #3: | 2.42 | 1.95 |
| II | School #1: | 2.75 | 1.98 |
| | School #2: | 4.79 | 3.39 |
| | School #3: | 2.42 | 1.95 |
| III | School #1: | 3.51 | 2.32 |
| | School #2: | 7.38 | 4.66 |
| | School #3: | 6.13 | 3.42 |
| IV | School #1: | 7.22 | 5.61 |
| | School #2: | 10.13 | 6.23 |
| | School #3: | 8.12 | 5.39 |
| V | School #1: | --.-- | -.-- |
| | School #2: | 11.31 | 6.71 |
| | School #3: | 13.84 | 6.61 |
| | School A: | 8.88 | 4.19 |
| | School B: | 3.34 | 2.16 |

ing eye-hand coordination and motor reaction abilities. These researchers examined athletes and non-athletes and found superior performance in the athletes in the visual skills areas of visual reaction time and motor reaction time while using the computerized Wayne Saccadic Fixator.

Gardner[18] tested a group of 346 athletes, made up of high school students, ages 15-18 years, and a select group of college basketball players. He used the Wayne Saccadic Fixator to measure preaction and reaction skills. It was found that with the visual preaction time, 73% of these athletes scored between 31-45, while on the visual reaction time 75% scored between 16-35.

The purpose of our study was to establish normative data along with standard deviations for three tests which can be performed using the Wayne Saccadic Fixator. These three tests are the Wayne near-far-near procedure, visual preaction time and visual reaction time. Each of these three tests were compared using the variables of sex and age in school children between the ages of 6-13 years.

We hypothesized that there would be no differences in performance at the .05 level of significance according to sex or age on the visual preaction time, visual reaction time, or near-far-near procedures.

## METHODS

The subjects of this study were male and female children aged 6-13 years. They were students attending one elementary school and one junior high school in the Muskogee Public School System of Muskogee, Oklahoma. Both of these schools are located in an urban middle-income area with common ethnic and racial backgrounds. A total of 228 children were examined, of which 126 were females and 102 were males.

To qualify for the study, subjects were required to demonstrate corrected or uncorrected Snellen visual acuities of at least 20/30 at distance and 20/30 at near (OD, OS, OU), normal extraocular muscle (EOM) function with no restrictions, no tropias (intermittent or constant) and no apparent pathology.

The subjects had passed a screening similar to the Modified Clinical Technique (MCT) used in the Orinda study.[23] The following order of testing was used. First, distance and near reduced Snellen acuities (OD, OS, OU) at standard testing distances of 20 feet and 16 inches were recorded. Secondly, extraocular muscle function was evaluated, using the basic H-Pattern. The fixation target was a gold Wolff wand held at 16 inches. Cover testing at distance and near was performed. Distance static retinoscopy with lens bar neutralization was performed, using a Snellen 20/30 distance target for fixation. A concave- mode streak retinoscope was utilized for this purpose. Retinoscopy was performed to rule out gross refractive problems which might be present even though the subject might still be able to meet the acuity criterion. Gross external inspection of the eyes was performed but ophthalmoscopy was not.

The following Wayne Saccadic Fixator tests were administered: near-far-near, visual preaction time and visual reaction time. The order of the testing procedures with the Wayne Saccadic Fixator was randomized.

Visual preaction time was performed in the following manner. The child was instructed to stand at arm's length from the instrument. The center of the instrument was adjusted to eye level for each child. The subject was told to depress as many lights as possible in a period of 30 seconds. In this mode, the lights remained on at a given location until the subject found the light and extinguished it.

The procedure for the visual reaction time test procedure was to position the subject as in the visual preaction procedure and instructions to the subjects were the same except that the child had only one second to extinguish the light before it flashed to another location. The visual reaction time was also performed for 30 seconds. On both of these procedures the subject was instructed to use either hand or that each hand could be used, as he or she wished. The Wayne near-far-near testing was accomplished by having the child sit at a distance of 15 feet from the Wayne Saccadic Fixator. Each child was instructed to press the letter on the control box before him which matched the letter beside the light on the distant instrument. Data rates were based on a 60- second time interval. Again, the child was instructed to use either hand or each hand, as he or she wished.

The children were examined in groups of five. The subjects were required to wear their habitual corrections during testing. All testing was performed during school hours. Each child had only one opportunity to perform each test and that data was recorded. In both schools, testing was accomplished in the same room and in-room location under consistent illumination levels. These lighting conditions for the

Wayne Saccadic Fixation procedures were measured with a photometer at both schools. The luminance across the face of the Wayne Saccadic Fixator averaged 126 nits at the elementary school and averaged 121 nits at the junior high school.

## RESULTS

A total of 102 male and 126 female subjects in our study met the criterion for inclusion in the statistical evaluations. None of the included subjects had restricted EOMs, tropias, notable external ocular pathology or visual acuities worse than 20/30 (OD, OS, OU). Distance phoria testing resulted in 143 with orthophoria, 70 with exophoria, and 16 with esophoria. Near phorias revealed 67 with orthophoria, 118 with exophoria and 44 with esophoria. Of those children screened, there were 10 females and 7 males who did not meet the criteria for inclusion in the study.

The number of subjects by six month intervals is shown in Table 2.

Table 3 shows the male/female mean and standard deviation data obtained for the Wayne near-far-near procedure by age and all-age inclusive. Both the males and females show a steady increase in rates without any notable plateaus or major variances. A comparison of the male to female means did not show a significant difference between the sexes, except at age 6.0 ($p<.02$) and age 12.5 ($p<.05$).

Table 4 shows the data from the visual preaction time. The data generally indicates a slowly rising linear progression in both male and female means. As with the Wayne near-far-near procedure, the male and female means are not significantly different.

Table 5 shows the visual reaction time data for the male and female subjects by age. These results differ from the visual preaction time data in that the scores are approximately half the mean of the visual preaction time at all subsequent age levels. With the exception of age 6.0 ($p<.05$) and age 12.5 ($p<.05$), there was no significant difference in performance between males and females when the data was compared by age.

Since there was no significant difference found between the performance of the sexes for the majority of ages on the tests in this study, the male/female data was combined. An analysis of age difference was performed for the half-year increments. There was no significant difference found between the half-year increments throughout the age progression. The data was then combined by whole year increments and is presented in Tables 6, 7 and 8.

**TABLE 2**
**NUMBER OF SUBJECTS BY AGE**
**(Six Month Intervals)**

| AGE | N |
|---|---|
| 6.0 years: | 9 |
| 6.5 years: | 14 |
| 7.0 years: | 20 |
| 7.5 years: | 10 |
| 8.0 years: | 20 |
| 8.5 years: | 20 |
| 9.0 years: | 14 |
| 9.5 years: | 28 |
| 10.0 years: | 19 |
| 10.5 years: | 12 |
| 11.0 years: | 14 |
| 11.5 years: | 23 |
| 12.0 years: | 12 |
| 12.5 years: | 4 |
| 13.0 years: | 9 |
| TOTAL: | 228 |

An analysis of variance was performed on the Wayne near-far-near procedure, visual preaction time and the visual reaction time data. This demonstrated that there were significant differences between the performance of different ages on all three individual tests ($p<.05$).

Statistical analysis comparing each age in yearly intervals by way of the t-test was performed on each of the three testing procedures. This analysis demonstrated that there was a significant ($p<.05$) transition point between 8- and 9-year-old children, with the 9-year-olds showing better performance on all of the Wayne Fixator procedures. Also, the 8-year-old children showed a significantly better performance ($p<.05$) when compared to the 7-year-old children on the Wayne near-far-near and visual preaction time procedures.

Incidental data was gathered on hand preference by sex (all ages inclusive) on both the Wayne fixation procedures (Table 9). Males had a 64.1% preference for using either hand in turn, while females had a 58.8% preference for utilizing only one hand.

## DISCUSSION

The means and standard deviations for the Wayne near-far-near procedure developed are, to our knowledge, the only ones available. Therefore, no comparisons to other studies are possible.

**TABLE 3**
**NEAR-FAR-NEAR DATA**

| AGE | | MEAN | SD | T-SCORE | SIG |
|---|---|---|---|---|---|
| 6.0 | M: | 9.5 | 2.12 | 2.28 | .02 |
| | F: | 13.8 | 3.10 | 2.28 | |
| 6.5 | M: | 15.4 | 3.65 | .15 | NS |
| | F: | 15.1 | 3.01 | .15 | |
| 7.0 | M: | 13.3 | 3.15 | -1.49 | NS |
| | F: | 15.8 | 4.19 | -1.49 | |
| 7.5 | M: | 18.0 | 1.73 | 1.76 | NS |
| | F: | 15.6 | 2.50 | 1.76 | |
| 8.0 | M: | 17.0 | 2.93 | .56 | NS |
| | F: | 16.3 | 2.40 | .56 | |
| 8.5 | M: | 18.7 | 4.90 | -.28 | NS |
| | F: | 19.2 | 4.31 | -.28 | |
| 9.0 | M: | 17.0 | 3.52 | -.66 | NS |
| | F: | 19.9 | 2.96 | -.66 | |
| 9.5 | M: | 20.6 | 3.61 | -1.47 | NS |
| | F: | 23.0 | 4.79 | -1.47 | |
| 10.0 | M: | 19.8 | 5.34 | -.83 | NS |
| | F: | 21.6 | 4.25 | -.83 | |
| 10.5 | M: | 22.7 | 4.51 | -.30 | NS |
| | F: | 23.6 | 4.00 | -.30 | |
| 11.0 | M: | 20.2 | 3.11 | -.64 | NS |
| | F: | 21.4 | 4.09 | -.64 | |
| 11.5 | M: | 22.8 | 5.24 | -.35 | NS |
| | F: | 23.4 | 3.20 | -.35 | |
| 12.0 | M: | 24.0 | 6.80 | .43 | NS |
| | F: | 22.8 | 3.20 | .43 | |
| 12.5 | M: | 23.0 | 6.24 | -6.13 | .05 |
| | F: | 31.0 | 1.30 | -6.13 | |
| 13.0 | M: | 27.0 | 1.87 | -.81 | NS |
| | F: | 28.0 | 1.83 | -.81 | |
| ALL AGES: | | | | | |
| | M: | 19.6 | 3.61 | -.37 | NS |
| | F: | 19.8 | 5.12 | -.37 | |

The results of the visual preaction time and the visual reaction time for the children in our study are much lower than the data reported by Sherman[15] and Gardner.[18] The results reported by Sherman were obtained from amateur and professional athletes. The results of Gardner's study were from high school athletes and a select group of college basketball players. Our subjects were much

**TABLE 4.**
**VISUAL PREACTION TIME (VPT) DATA**

| AGE | | MEAN | SD | T-SCORE | SIG |
|---|---|---|---|---|---|
| 6.0 | M: | 11.0 | 5.65 | 6.97 | NS |
| | F: | 10.7 | 2.36 | 6.97 | |
| 6.5 | M: | 12.0 | 2.91 | .81 | NS |
| | F: | 13.2 | 2.28 | .81 | |
| 7.0 | M: | 13.3 | 2.21 | 1.12 | NS |
| | F: | 12.2 | 1.99 | 1.12 | |
| 7.5 | M: | 14.0 | 2.65 | .83 | NS |
| | F: | 12.8 | 2.15 | .83 | |
| 8.0 | M: | 13.8 | 1.79 | .54 | NS |
| | F: | 14.2 | 1.56 | .54 | |
| 8.5 | M: | 14.8 | 2.59 | -.31 | NS |
| | F: | 15.1 | 2.54 | -.31 | |
| 9.0 | M: | 15.8 | 6.60 | .13 | NS |
| | F: | 16.2 | 2.70 | .13 | |
| 9.5 | M: | 17.1 | 2.90 | 1.37 | NS |
| | F: | 15.7 | 2.67 | 1.37 | |
| 10.0 | M: | 18.1 | 4.58 | .12 | NS |
| | F: | 17.9 | 2.88 | .12 | |
| 10.5 | M: | 15.0 | 2.00 | -1.38 | NS |
| | F: | 17.1 | 3.02 | -1.38 | |
| 11.0 | M: | 16.2 | 3.14 | -.80 | NS |
| | F: | 17.7 | 3.54 | -.80 | |
| 11.5 | M: | 19.4 | 3.83 | .25 | NS |
| | F: | 19.0 | 3.63 | .25 | |
| 12.0 | M: | 17.9 | 4.64 | -1.73 | NS |
| | F: | 20.8 | 0.50 | -1.73 | |
| 12.5 | M: | 18.0 | 6.08 | -2.29 | NS |
| | F: | 21.0 | 1.30 | -2.29 | |
| 13.0 | M: | 20.0 | 5.34 | -.81 | NS |
| | F: | 23.0 | 5.60 | -.81 | |
| ALL AGES: | | | | | |
| | M: | 16.1 | 4.08 | .54 | NS |
| | F: | 15.8 | 3.94 | .54 | |

**TABLE 5:**
**VISUAL REACTION TIME (VRT) DATA**

| AGE | | MEAN | SD | T-SCORE | SIG |
|---|---|---|---|---|---|
| 6.0 | M: | 5.5 | .71 | 2.47 | .05 |
| | F: | 3.7 | 1.38 | 2.47 | |
| 6.5 | M: | 4.0 | 2.12 | -1.07 | NS |
| | F: | 5.7 | 3.67 | -1.07 | |
| 7.0 | M: | 5.3 | 1.89 | -.65 | NS |
| | F: | 5.9 | 2.40 | -.65 | |
| 7.5 | M: | 5.3 | 2.08 | 3.86 | NS |
| | F: | 5.3 | 1.25 | 3.86 | |
| 8.0 | M: | 6.7 | 2.80 | .27 | NS |
| | F: | 6.3 | 3.42 | .27 | |
| 8.5 | M: | 5.9 | 2.25 | 1.67 | NS |
| | F: | 7.4 | 1.72 | 1.67 | |
| 9.0 | M: | 6.8 | 1.89 | -.72 | NS |
| | F: | 7.6 | 2.22 | -.72 | |
| 9.5 | M: | 8.6 | 3.20 | -1.63 | NS |
| | F: | 8.6 | 3.45 | -1.63 | |
| 10.0 | M: | 7.6 | 2.39 | -1.59 | NS |
| | F: | 9.5 | 2.88 | -1.59 | |
| 10.5 | M: | 6.7 | 2.89 | -1.34 | NS |
| | F: | 9.1 | 2.26 | -1.34 | |
| 11.0 | M: | 8.6 | 2.70 | -.81 | NS |
| | F: | 9.8 | 2.39 | -.81 | |
| 11.5 | M: | 9.3 | 2.49 | -.49 | NS |
| | F: | 9.8 | 2.85 | -.49 | |
| 12.0 | M: | 8.4 | 2.88 | -.95 | NS |
| | F: | 10.3 | 3.40 | -.95 | |
| 12.5 | M: | 9.7 | 4.16 | -4.09 | .05 |
| | F: | 15.0 | 1.30 | -4.09 | |
| 13.0 | M: | 10.8 | 3.42 | 1.27 | NS |
| | F: | 8.8 | .96 | 1.27 | |
| ALL AGES: | M: | 7.4 | 3.02 | -.92 | NS |
| | F: | 7.8 | 3.22 | -.92 | |

**TABLE 6.**
**WAYNE NEAR-FAR-NEAR**
**Means & SD by Years of Age**

| AGE | MEAN | SD |
|---|---|---|
| 6 | 14.3 | 3.36 |
| 7 | 15.4 | 3.56 |
| 8 | 17.7 | 3.85 |
| 9 | 20.8 | 4.56 |
| 10 | 21.8 | 4.52 |
| 11 | 22.4 | 4.07 |
| 12 | 24.0 | 5.72 |
| 13 | 27.4 | 1.81 |

**TABLE 7.**
**WAYNE VISUAL PREACTION TIME**
**Means & SD by Years of Age**

| AGE | MEAN | SD |
|---|---|---|
| 6 | 12.0 | 2.76 |
| 7 | 12.7 | 2.12 |
| 8 | 14.5 | 2.20 |
| 9 | 16.3 | 3.17 |
| 10 | 17.5 | 3.35 |
| 11 | 18.4 | 3.35 |
| 12 | 18.8 | 4.12 |
| 13 | 21.3 | 5.34 |

**TABLE 8.**
**WAYNE VISUAL REACTION TIME**
**Means & SD by Years of Age**

| AGE | MEAN | SD |
|---|---|---|
| 6 | 4.7 | 2.67 |
| 7 | 5.6 | 1.98 |
| 8 | 6.5 | 2.71 |
| 9 | 8.1 | 2.93 |
| 10 | 8.7 | 2.65 |
| 11 | 9.5 | 2.56 |
| 12 | 9.5 | 3.37 |
| 13 | 9.9 | 2.71 |

younger than the participants in either of these studies and were not high school, college or professional athletes. The significantly higher scores obtained in the adult athletes could be a product of their athletic skills or to their older age. The findings of our study would tend to support a correlation between higher rates at older ages.

Our results are similar to those of Appler and Quimby[16] in that we also found an increasing level of performance with increased age on all of the Wayne Fixator procedures. Comparisons of the results of the visual preaction time and the visual reaction time to Appler and Quimby's study are difficult. These researchers reported their means and standard deviations on the procedures by grade level. Our results were reported by age. Also, they used different illumination levels at the three school systems they studied.

In our study the younger children seemed to have much more difficulty with the visual reaction time than the older children. A possible reason could be their smaller physical stature. The younger child's shorter arm length made the viewing angle greater and also appeared to make it more difficult for the child to reach the illuminated buttons.

During testing of the visual preaction and visual reaction times, hand preference was recorded. We found a difference in

**TABLE 9.**
**HAND PREFERENCE**
**(All Age Inclusive)**

| | | |
|---|---|---|
| MALES | | |
| Right Hand: | (33) | 32.0% |
| Left Hand: | (4) | 3.9% |
| Either Hand: | (66) | 64.1% |
| FEMALES | | |
| Right Hand: | (68) | 54.0% |
| Left Hand: | (6) | 4.8% |
| Either Hand: | (52) | 41.2% |
| OVERALL (MALE AND FEMALE) | | |
| Right Hand: | (101) | 44.1% |
| Left Hand: | (10) | 4.4% |
| Either Hand: | (118) | 51.5% |

hand preference patterns observed while using the Wayne Fixation procedure between the sexes. We observed a relatively higher right hand preference for females when compared to males. Previous studies by other investigators have demonstrated that slight sex differences exist in patterns of hand preference; that is, males tend to exhibit less right hand preference as compared to females.[24,25,26,27] Conversely, we noted that a relatively greater number of males used each hand during the testing, whereas the females tended to opt for one-hand performance.

## SUMMARY AND CONCLUSIONS

An important factor in visual therapy is patient motivation.[28] From our testing we observed that the children appeared to enjoy the procedures with the Wayne Saccadic Fixator. For this reason the use of this instrument could be advantageous in the testing and enhancement of particular visual skills.

An area of interest in future studies could be the level of correlation between academic performance and scoring on the Wayne procedures. Further, subjects could be studied to determine if or where performance asymptotes on the Wayne procedures.

Because of time and fiscal constraints we were unable to determine reliabilities and standard errors of measurement on these three tests. Future research is needed to develop these clinically valuable statistics.

Normative data and standard deviations have been reported for the three Wayne procedures. These norms may be used by the clinician in the diagnosis of dysfunctions of oculomotor-visuomotor and near-far-near performances. These performance criteria can periodically be reevaluated during the course of a vision therapy program. Improvement in the scores of these procedures would document changes as a result of therapeutic intervention.

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## SOURCE

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