A Chronometric Analysis of the Effect of Sex and Sensory Modality on the Running Performance of Visually Handicapped Individuals

Bonnie Lynn Chalmers

The College at Brockport

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A CHRONOMETRIC ANALYSIS OF THE EFFECT OF SEX AND SENSORY MODALITY ON THE RUNNING PERFORMANCE OF VISUALLY HANDICAPPED INDIVIDUALS

by

Bonnie Lynn Chalmers

Thesis submitted to the Faculty of the Graduate School of the State University of New York College at Brockport in partial fulfillment of the requirements for the degree of Master of Science 1979
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<thead>
<tr>
<th>College Institution</th>
<th>Dates</th>
<th>Degree</th>
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The purpose of this study was to experimentally compare the effect of two sensory aids on the running performance of 40 female and 40 male visually handicapped subjects participating in a 40 yard dash. The subjects ranged in age from 6-21 and attended various schools and institutions in Massachusetts, New Jersey, and New York. The subjects were blocked according to sex and randomly assigned to one of two treatment conditions. Those assigned to treatment one utilized an audible goal locator. Those assigned to treatment two utilized a tactual guide wire. The subjects were tested individually. A timed performance score was recorded for each subject. A 2 x 2 factorial design for the variables of sex and sensory aid was used. The analysis of variance indicated that there was no significant difference in the scores of subjects utilizing an audible goal locator as compared to a tactual guide wire. A significant \( p \leq 0.001 \) main effect for sex was found. Visually
handicapped males performed significantly faster than females. This finding supported research concerning visually impaired males and females on various physical performance tests. No significant interactive effect was noted for the variables of sex and sensory aid. Mean examination indicated that females performed slightly faster utilizing the audible goal locator while males performed slightly faster using the tactual guide wire. Suggestions were offered in an attempt to further research concerning performances of visually handicapped individuals, in various physical settings and for evaluating the effectiveness of sensory aids.
DEDICATION

To my family and friends
for your continuous support, understanding, and love
ACKNOWLEDGMENTS

I would like to take this opportunity to thank those individuals who have given to themselves in so many ways, enabling me to experience, learn, and grow during my graduate work.

First, and foremost I would like to thank Dr. John Silva, my major advisor for this thesis, for all the unselfish time, encouragement, and knowledge he has provided in helping me develop and complete this project. His inspiration and dedication to the field of research has enabled me to grow professionally as well as an individual. I would also like to thank Dr. Joseph Winnick for directing the grant which subsidized my graduate study and sharing his vast knowledge of physical education for children with handicapping conditions. Sincere graditude is also expressed to Dr. Ted Johnson for his assistance in contributing ideas, suggestions, and support.

A special thanks is given to all the individuals who assisted as timers during the data collection; without their help, the information needed to complete this project could not have been successfully obtained. Thanks to: Joe Broderick, Glenn Chalmers, Bambi Crance, Stephanie Silvoy, and Roy Speedling.
I am additionally thankful to Chris Silva and Debbie Shuster, who have provided assistance in proofing, typing, as well as moral support throughout the year.

Finally, I would like to sincerely thank those faculty and visually handicapped individuals who have participated in the collection of this research, enabling me to contribute information to the field of adapted physical education for the visually impaired.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vii</td>
</tr>
<tr>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION AND STATEMENT OF THE PROBLEM</td>
<td>1</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>THE PROBLEM</td>
<td>6</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>6</td>
</tr>
<tr>
<td>Statement of the Hypotheses</td>
<td>6</td>
</tr>
<tr>
<td>Rationale for Hypotheses</td>
<td>8</td>
</tr>
<tr>
<td>Scope of the Study</td>
<td>10</td>
</tr>
<tr>
<td>DEFINITION OF TERMS</td>
<td>11</td>
</tr>
<tr>
<td>Constitutive Definitions</td>
<td>11</td>
</tr>
<tr>
<td>Operational Definitions</td>
<td>11</td>
</tr>
<tr>
<td>II. REVIEW OF LITERATURE</td>
<td>13</td>
</tr>
<tr>
<td>Research in Non-Physical Settings</td>
<td>13</td>
</tr>
<tr>
<td>Adaptations and Modifications of Physical Education Programs for the Visually Impaired</td>
<td>15</td>
</tr>
<tr>
<td>Research in the Physical Education Setting with the Visually Impaired</td>
<td>20</td>
</tr>
<tr>
<td>Summary of Related Literature</td>
<td>23</td>
</tr>
</tbody>
</table>
### III. PROCEDURES

- Selection of Subject Population ........................................... 24
- Design .................................................................................. 24
- Method .................................................................................. 25
- Statistical Procedures ............................................................ 26

### IV. RESULTS AND DISCUSSION ................................................... 28

### V. SUMMARY, CONCLUSIONS, RECOMMENDATIONS .................... 36
- SUMMARY .............................................................................. 36
- CONCLUSIONS ....................................................................... 38
- RECOMMENDATIONS ................................................................. 38

### APPENDICES

- A. AUDIBLE GOAL LOCATOR .................................................... 40
- B. TACTUAL GUIDE WIRE ......................................................... 42
- C. BUFFALO PARENTAL CONSENT FORM ................................. 44
- D. EXPERIMENTAL TESTING PROCEDURES ............................... 47
- E. PRELIMINARY INVESTIGATION ............................................. 51
- F. PRELIMINARY INVESTIGATION DATA RECORDING SHEET .... 58
- G. PRELIMINARY INVESTIGATION RAW DATA ............................ 61
- H. PRIMARY INVESTIGATION DATA RECORDING SHEET .......... 64
- I. PRIMARY INVESTIGATION RAW DATA .................................... 70

### REFERENCES 

- REFERENCES ........................................................................... 75
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Data Analysis of the Preliminary Investigation</td>
<td>55</td>
</tr>
<tr>
<td>2. Descriptive Data</td>
<td>29</td>
</tr>
<tr>
<td>3. Analysis of Variance of Sex and Sensory Aid</td>
<td>30</td>
</tr>
</tbody>
</table>
Chapter I

INTRODUCTION AND STATEMENT OF THE PROBLEM

INTRODUCTION

Never check the actions of the blind child; follow him, and watch him to prevent any serious accidents, but do not interfere unnecessarily; do not even remove obstacles which he would learn to avoid by tumbling over them a few times. Teach him to jump rope, to swing weights, to raise his body by his arms and to mingle, as far as possible, in the rough sports of the older students, and do not be apprehensive of his safety, and if you see him clambering in the branches of a tree, be sure he is less likely to fall than if he had eyes. Do not too much regard bumps upon the forehead, rough scratches or bloody noses, even these may have their good influences. At the worst they affect only the bark, and do not injure the system, like the rust of inaction.

(Samuel Gridley Howe, 1841, p.17)

The number of blind children attending regular classes in public schools throughout the United States is rapidly increasing. Efforts are being made to accommodate, integrate, and/or mainstream these individuals into the educational systems. The federal legislation of Public Law 94-142 (1975) and state de-institutionalization have enabled the handicapped, particularly the visually impaired child, an opportunity to lead a normal life.

In the past, visually handicapped children have been deprived of the freedom to move, explore, and discover the
physical world to a great extent. Buell (1969, 1970, 1971) stated that this is not due to their inability to participate in such experiences, but primarily to the attitudes held by administrators, teachers, and parents of visually impaired children. These misconceptions, overprotections, and safety implications, resulting in inactivity, have led to the additional handicaps of idleness and alienation further disabling the visually impaired individual.

A review by Adams, Daniel, and Rullman (1972) cited that children who are blind or who have extremely poor vision, also lack skills in body control, static balance, coordination, and agility. Additional research concerning the visually handicapped child has reported various problems with perceptual skills resulting in poor posture, distorted body image (Cratty and Sams, 1968; Cratty, 1971; Hanninen, 1975), lack of dexterity (Oliver, 1970), and deficient orientation and mobility skills (Trevena, 1970). The lack of general motor ability and physical fitness of the visually impaired child (Trevena, 1970) has been attributed to additional deficits in physical motor development, particularly dynamic balance (Buell, Note 1), strength, power, and endurance (Oliver, 1970).

Upon reviewing the literature, it appears that the area of physical education should play an important role in the growth, development, and mobility of the visually impaired.
Buell (1971) however, stated that at least two-thirds of the visually handicapped children attending public schools are not given vigorous physical education, even though high levels of physical fitness are more important for the visually impaired than for persons with normal vision. Buell expanded this argument by indicating that visually impaired individuals must expend more energy to perform, achieve, and succeed at the level of their seeing peers.

Oliver (1970) concurred with Buell in declaring that only by taking part in strenuous physical activity can a sound musculature be developed. He continued to report that the important aims and unique contributions of physical education are to promote development and improvement of strength and endurance through the systematic use of muscles and muscle groups. Visually handicapped children therefore, who lack sound musculatures with respect to strength and endurance, require physical education to a greater extent as compared to their sighted peers.

Oliver also pointed out that additional benefits of physical activity include socialization skills and improved body awareness. In conclusion, he emphasized that contributions of physical education in the total education of visually impaired children should never be underestimated.

Buell (1950) demonstrated that along with other developmental concerns, the visually handicapped also have
particular difficulty with throwing and running skills. Since running is a good form of exercise available for maintaining healthy bodies and reducing the risk of heart attack as well as overall coordination, attention should be given to the proper development of this skill.

Visually impaired individuals, however, need not lack in their running skills. A list of outstanding athletes who competed in a variety of sports was cited by Buell (1969). One such athlete is Gary Vann who is partially sighted and ran the 13th fastest marathon of 1967 in the United States in Culver City, California. Other outstanding athletes who have excelled in running events include totally blind Harry Cordellos, who ran the Boston Marathon under three hours (Gettman and Pollock, 1970) and Tom Rothrock, a blind runner who competed in a 50 mile course through rugged terrain. Such athletes have demonstrated that it is their eyes that do not function, not their muscles.

Many educators have attempted to improve the various levels of physical/motoric development and achievement of the visually handicapped through the use of sensory aids. Research by Lauer (1971) has verified that gross motor skill performance can often be enriched through the utilization of various sensory objects, marks, spots, or devices. Arnheim, Auxter, and Crowe (1977) supported Lauer's research in describing the importance of equipment which enhances spatial orientation, such as guide wires for swimming and running events. Some
other examples of sensory aids related to the area of physical education include: audible goal locators, audible balls, tandem bicycles, stationary exercycles, multi-textured archery targets, and aluminum guide rails for bowling.

Schools for the blind have utilized various sensory devices to aid the visually handicapped individual perform in running events. Buell (1973) has cited several running aids which serve as possible and practical adaptations for the sightless runner. The aids mentioned included a tactual guide, stretched 100 yards without intervening supports and a whistle blown in front of a runner, signifying an auditory cue.

While sensory aids have been widely used by the visually handicapped, Reid (Note 4) has succintly noted the scarcity of research addressing their utilization in the teaching and performing of various motor skills. Furthermore, little research exists that demonstrates which modality the visually handicapped learn through most efficiently and whether these modalities are activity specific or generalizable.

The intent of this study was to systematically compare the effects of two sensory aids upon the performance of visually handicapped females and males in a 40 yard dash. The two sensory aids utilized consisted of an audible goal locator and a tactual guide wire.

Since the subject of physical education is one of the earliest areas where mainstreaming occurs, research such as
this should provide much needed information regarding the influence of sex and sensory modality on the performance of a running skill by visually handicapped individuals.

Results of this study should also aid those individuals who are visually impaired, perform more safely and efficiently in physical education programs. Those individuals who work with the visually impaired may also benefit from such information in establishing greater insights for determining the effectiveness of these sensory aids and the value they may offer. The physical educator, provided with this information, may be able to make a significant contribution to the satisfactory adjustment and development of visually impaired individuals. This may help them function closer to normal patterns that exist in school and society.

THE PROBLEM

Statement of the Problem

Is there a significant difference in the timed performance scores of visually handicapped subjects as a function of either the sex of the subject or the sensory aid utilized in a 40 yard dash?

Statement of the Hypotheses

Null Hypotheses: The following null hypotheses were established:

(1) There is no significant difference in the timed
performance scores of visually handicapped individuals performing with the use of an audible goal locator as compared to a tactual guide wire.

(2) There is no significant difference between the timed performance scores of visually handicapped males as compared to visually handicapped females.

(3) There is no significant interaction effect between the sex of the visually handicapped individual and the type of sensory aid utilized.

Research Hypotheses: The following research hypotheses were advanced:

(1) There is no significant difference in the timed performance scores of visually handicapped individuals performing with the use of an audible goal locator as compared to a tactual guide wire.

(2) Visually handicapped males will have significantly faster timed performance scores as compared to visually handicapped females.

(3) There will be a significant interaction effect between the variables of sex and sensory modality.

(a) Visually handicapped males utilizing an audible goal locator will have significantly faster timed performance scores than visually handicapped males utilizing a tactual guide wire.

(b) Visually handicapped females utilizing a tactual guide wire will have significantly faster timed performance
scores than visually handicapped females utilizing an audible goal locator.

(c) Visually handicapped males utilizing an audible goal locator will have significantly faster timed performance scores as compared to visually handicapped females utilizing an audible goal locator.

(d) There will be no significant difference in the timed performance scores of visually handicapped males utilizing a tactual guide wire as compared to visually handicapped females utilizing a tactual guide wire.

Rationale for Hypotheses

The first research hypothesis addressed a nonsignificant finding of sensory aid. Although it was thought that both sensory aids would enable visually handicapped individuals to safely participate in the running of a 40 yard dash, neither was believed to significantly effect the performance scores of those subjects utilizing one sensory aid when compared to subjects utilizing the other sensory aid.

The second research hypothesis predicted a significant main effect for sex. This prediction was advanced in support of the findings of Buell (Note 1) concerning visually handicapped males exceeding physical performance levels of visually handicapped females.

An interaction of sex and sensory aid was predicted.
In the first part of the interaction, it was believed that visually handicapped males would perform significantly faster utilizing the audible goal locator as compared to the tactual guide wire. This prediction was hypothesized due to the various physical activities of visually impaired males. That is, it was thought that the tactual guide wire would inhibit their performance because of a lack of proper arm swing in holding onto the guide wire, therefore performing faster to the audible goal locator which would enable them to freely run at their maximum speed.

The second part of the interaction predicted visually handicapped females performing significantly faster utilizing the tactual guide wire as compared to the audible goal locator. It was believed that due to limited physical activity involvement of visually impaired females, as noted by various writers, the females would run faster with the security of a tactual guide wire as compared to an insecurity or hesitation in running to an auditory cue.

The third section of the interaction has predicted that visually handicapped males would perform significantly faster than the females utilizing an audible goal locator. This prediction was advanced due to the predicted sex significance as stated in research hypothesis two, and the prediction of males performing faster using the tactual guide wire and females performing slower using the audible goal locator as compared to the tactual guide wire.
The final part of the interaction had predicted no significance in the performances of visually handicapped males and females utilizing the tactual guide wire. This was predicted due to the other sex and sensory aid predictions. That is, with the males performing slower with the tactual guide wire and females performing faster, as compared to the audible goal locator, it is believed that the differences between the scores of males and females using the guide wire would be nonsignificant.

Scope of the Study

The present study utilized 40 female and 40 male visually handicapped individuals aged 6-21 years from various schools and institutions in Massachusetts, New Jersey, and New York. An attempt was made to determine if the timed performance scores recorded for a 40 yard dash were influenced by the sex of the subject or the type of sensory aid utilized during the running.

The study employed the use of an audible goal locator and tactual guide wire as representing the two sensory aids. Since age of visually handicapped individuals utilized in the study was not made available, no age trends could be determined.
DEFINITION OF TERMS

Constitutive Definitions

**Visually Handicapped.** Those individuals who must be educated through channels other than vision, or require the use of special aids to capitalize on residual vision (Arnheim, Auxter, and Crowe, 1969).

**Audible Goal Locator.** An electronic apparatus which emits a sound which can be regulated for pitch, volume, and frequency.

**Guide Wire.** A tactual sensory device used by visually handicapped individuals as an aid to guide them during a physical task, usually in running events (Buell, 1973).

Operational Definitions

**Visually Handicapped.** Female and male individuals, 6-21 years of age, attending Batavia School for the Blind, Batavia, New York; School #5 in Rochester, New York; School #84 in Buffalo, New York; Helen Keller School in Newark, New Jersey; and Perkins School for the Blind in Watertown, Massachusetts, who are totally or partially blind. (Partial or legal blindness is defined as 20/200 with correction in the better eye, or a field limitation of 20 degrees or less. Total blindness is defined as having no useful vision.)

**Audible Goal Locator.** Olsen #s-453 audible goal locator positioned 50 yards from the starting line, directly facing the runner, with frequency set at .8 Khz., emissions at 250
pulsations per minute, and volume at 100 Db., throughout the testing (Chalmers, Note 2; Cratty, 1971; Wever, 1949). The audible goal locator appears in Appendix A.

Guide Wire. Seine Twine Chalk Line #72 2 76193 running 50 yards long with a 10" long plastic hose 3/4 in diameter, fitted over this cord. The hose is grasped by the runner at a height of 33" from the ground. This height placed the cord at approximate hip height level of females and males aged 6-21 (Clarke, 1976).

The apparatus used to support the cord, consisted of two 3/4" x 3 1/2" pieces of wood 36" long, cemented 3" into two 6 1/2" high tire rims. This was constructed to enable the boards to be removed from the rims for transportation purposes. Two 4" wooden wedges stabilized each board while testing took place. One 3 1/2" x 7 1/2" cinder block, 15" long, was placed on the far edge of each rim for extra needed support enabling proper tautness of the cord. A metal support was screwed into each board for the tying of the cord at the specified height. The guide wire support system appers in Appendix B.
Chapter II

REVIEW OF RELATED LITERATURE

There is an abundance of information devoted to the poor motor skill of the visually handicapped and the plausible causes of this condition (Adams, Daniel, and Rullman, 1972; Fait, 1976; Sherrill, 1976; Winnick, 1979). In contrast there is a scarcity of literature related to efficient teaching techniques for this population. The literature is primarily clinical in nature and has addressed the use of tactual or haptic aids in the learning of academic skills.

The literature reviewed in this chapter is divided into three sections. The first section presents research concerning visually handicapped individuals in non-physical settings. Section two reviews the writings of various educators offering adaptations and modifications for visually handicapped individuals involved in physical education programs. Section three reviews research pertaining to the visually handicapped individual in physical education settings.

Research in Non-Physical Settings

As was noted earlier, much of the past research concerning visually handicapped individuals has dealt with the acquisition of academic skills. The utilization of various equipment such as braille and recorded material have enabled
the visually handicapped student to grow and develop academically. The research presented in this section deals with auditory and tactual learning in non-physical settings.

Morris, Nolan, and Phelps (1973) conducted a study to determine the relative efficiency of auditory and tactual media on academic achievement. The sample consisted of 56 visually handicapped subjects in grades 5-12. Recorded (auditory) and textural materials in various subject areas were used. It was discovered that the auditory modality (recorded material) may be 155% to 360% more efficient than information transmitted through the tactual modality, in a non-physical setting.

Juurmaa and Suonio (1975) studied the role of audition and motion in the spatial orientation of blind and sighted individuals. The sample consisted of 5 congenitally blind, 5 accidentally blinded, and 5 sighted subjects, between the ages of 19-45 years old. Each subject was evaluated on three types of tests conducted in a hall, 17 x 11 meters. Each involved a physical retracing of steps back to a starting point in a variety of patterns. The sighted subjects were blindfolded during the testing. All subjects participated in each test twice. The first time normal hearing was utilized, the second time ear plugs were worn to suppress any auditory cues/feedback from the environment.
An analysis of variance was used in determining statistical differences. It was discovered that the lack of auditory cues impaired the performance of the blind more than that of the sighted.

A survey of research relative to sound localization was conducted by Cratty (1971). He stated that the greatest accuracy in straight-line walking may be expected if a single sound source (sounding continuously) is placed toward the front of the individual.

Wever (1949) examined the localization of sounds in space. By reviewing numerous studies he discovered that increased binaural phase difference resulted in the displacement of tones from the median planes. In summarizing the finding of the studies, he reported that phases up to 1,000 cycles per second permitted easy judgement of sound direction for all times.

Adaptations and Modifications in Physical Education Programs for the Visually Impaired

Educators have often attempted to create adequate environments for the physical education of the visually handicapped. Hyman (1969) constructed three devices to aid a visually handicapped student successfully participate in an archery unit. The first included a footboard, so the feet and body of the student were properly aligned with
the target. The second consisted of a tow line rope, attached from the top of the target to the footboard. This allowed the student to retrieve her arrows and helped in the tactual guiding of the bow in shooting. The last aid used was a five textured archery target enabling identification of points.

Citron (1971) reported on the benefits available from an ordinary tin can for the blind child. Such benefits from this piece of "equipment" include: exercise, ear-foot coordination, gross motor skill development, and the sharpening of hearing and locating senses. Each successful new kick also rewards the visually impaired child with immediate auditory reinforcement or feedback. Citron concluded in stating that innovative games such as tin can soccer can be developed and successfully played and enjoyed by all.

A modified softball game was presented by Bolt (1970) in which the three game elements of batting, pitching, and running were modified along with several rule changes to enable visually handicapped students to participate with sighted classmates. The visually impaired students were able to successfully bat by kneeling at home plate. A 23" soft-light playground ball was rolled to the batter who swung upon a command from a sighted catcher. The softball diamond itself, was also revised. A pole was placed
at each of the four bases. Rope extended to each of the poles guided the blind runner around the bases. Two knots were placed ahead of each point where rope was attached to the poles. The first knot was to warn the student to slow down; the second knot meant the runner should stop and extend his foot out to touch the base. A short length of pipe was added which was fitted over the rope to avoid friction of hand and rope when running. With these few modifications, visually handicapped students were able to participate successfully with sighted peers in a game of softball.

Johansen (1971) developed a curriculum for integrating visually handicapped children into a public elementary school physical education program with sighted peers. The program objectives consisted of (1) development of physical fitness, (2) development of desirable social, emotional, and mental habits and attitudes, (3) physical skill development, (4) development of leisure time activities and (5) cognitive skills needed for successful physical involvement in a variety of activities. Visually handicapped children were integrated with sighted peers in meeting these objectives through activities such as body conditioning, exercises, rope jumping, physical fitness testing, games and relays, tumbling and pyramids, pole climbing, balance beam stunts, self-testing activities, and ice skating. The majority of the modifications described
included the utilization of tactual teaching and precise verbal instructions.

Miller (1971) discussed how the use of a portable guide rail enabled visually handicapped individuals to effectively compete in bowling. This rail was constructed of light weight tubular metal, 3 feet high and 9 feet long, with four ten-pin bowling balls utilized as weights in the base at each end of the rail. The individual would position him/herself at the far end of the rail holding on with one hand. The visually handicapped bowler would then proceed to slide that hand down the rail while delivering the ball with the other hand. He explained that this allowed the individual to aim the ball as well as locate him/herself in relation to the foul line.

Goldish (1968) stated that the most useful and used informational channel the visually handicapped possess is that of the auditory. The benefit of using auditory cues in physical education programs and activities for the visually handicapped would aid in improving the motor performance of these individuals.

An auditory aid was proposed by Gallagher (1977) which consisted of a radio transmitter which would help totally blind individuals run in an uninhibited and controlled manner by eliminating or minimizing many of their problems with running. It was suggested that the transmitter, operated by one lever, would generate tones in
miniature receiving units in the ears of the blind individual. A humming sound would be heard as long as the runner remained on his/her designated course. If, however, he/she strays to the right, a high beeping would emit and continue in intensity the further he/she deviated from the course. Likewise, if a straying to the left occurred, a low beeping sound would be heard. A sighted person would manipulate the lever which would produce the intensity of both beeping and humming sounds. Although no testing or construction of the device was made, the suggestions and ideas presented possible benefits of such a device for the blind runner.

Additional techniques to aid the visually handicapped runner in a variety of running situations were offered by Buell (1971). While two classmates hold the ends of a window cord, the visually handicapped child is able to sprint 50 yards, or longer distances, to build up endurance, while holding onto the cord and utilizing it as a guide. Running hand in hand with sighted peers also provides the visually impaired child adequate security and guidance. Other suggestions included running while holding onto a belt or string attached to a sighted runner. Auditory cues such as a caller, whistle, or bicycle with cardboard attached to hit the spokes, could also supply the appropriate signals needed by the visually handicapped runner.
Research in the Physical Education Setting with the Visually Impaired

According to Buell (1950), the factors affecting motor performance of the visually handicapped are: (1) amount of vision, (2) duration of the visual handicap or onset, (3) parental attitude, and (4) physical education received. His research further indicated that boys with defective vision perform relatively better than do girls. Additionally, visually handicapped boys more closely approach physical proficiency norms for the seeing than do visually handicapped girls. One reason given for this is that special schools for the visually handicapped usually provide more physical education for the male sex.

Later studies by Buell (1966, 1973) tested for physical fitness of the visually handicapped and found that they performed equal to that of sighted individuals in pull-ups, sit-ups, squat thrusts, and standing broad jump, but scored far below the average in the 50 yard dash and 600 yard walk/run. He cited that poor performances of the visually handicapped in running is of great concern and stated that physical educators of blind children should work diligently to improve the child's performance in this event.

In terms of overall performances, he noted that visually handicapped boys consistently improve between the ages of 6 and 17 while visually handicapped girls improve
between the ages of 6 and 13 or 14 and then plateau in their physical proficiency. He also reported that differences between the normally sighted and visually handicapped decrease with age.

Although visually handicapped boys and girls follow a normal progression in motor development, several writers (Buell, Note 1; Gesell, Ilg, Bullis, 1950; Myler, Note 3; Norris, Spaulding, and Brodie, 1957; Wilson and Halverson, 1947; and Winnick, 1979) state that there is a wide performance variation within the visually handicapped population.

Reid (Note 4) studied the effects of auditory cues on the bowling performances of the visually handicapped. The sample consisted of 30 visually handicapped subjects, ranging in age from 11-21 years. The tasks involved bowling with and without a cue supplied by an audible goal locator. The design utilized in the study was a 2 x 2 x 2 factorial analysis of variance (ANOVA) with the levels being acquired or congenital blindness, with or without an audible goal locator, and day one versus day two. The results of the study indicated that the audible goal locator significantly (p ≤ .01) improved the bowling performance of acquired and congenitally blind subjects. The investigation concluded that the use of an audible goal locator can significantly improve the bowling performance of the visually impaired.

Rogers (Note 5) conducted a study to determine the
usefulness of selected auditory and tactual aids in enabling the blind to participate in badminton. The sample consisted of ten female and eight male visually impaired subjects ranging in age from 13-18 years. A sound emitting shuttlecock constituted one of the auditory aids. The other auditory device utilized was a locator device. This was attached to each player enabling detection of the opponent. A court was constructed which provided three different textured surfaces, representing the tactual aid. The subjects were tested at three different intervals through objective and subjective evaluation. The usefulness of these aids were evaluated by a panel of judges. The results of the study revealed that the sound emitting shuttlecock and three textured court proved to be effective and useful aids, enabling the visually handicapped to participate in badminton.

An electronic device to aid the running of a blind athlete, was devised by Balmer (1970). This device was worn on the back of a runners waistbelt. Two deaf aid earpieces mounted on a spectacle frame were also warn enabling the presentation of auditory signals. A wire laid at the side of a track produced the appropriate guidance signals through which these devices provided proper interpretation to the runner. At the time of the article, however, the writer stated that this device had only initial field trials performed with limited success.
Summary of Related Literature

The literature presented has provided information concerning the performances of visually handicapped children in non-physical and physical settings. It is noted that numerous articles exist pertaining to the successful participation of visually handicapped children utilizing various auditory and tactual aids when adapting and modifying various physical activities. However, there is a scarcity of data based information available concerning the value of these sensory aids in determining which modality more effectively and effectively facilitates the learning and performance of the visually impaired.

Information is also needed to determine if these sensory aids are activity specific or generalizable. That is, does the effectiveness of the sensory aid vary with the specificity of the physical skill or is one modality consistently superior to the other in all areas of physical activity of the visually impaired.

Another variable to be considered is the sex factor of visually handicapped males versus visually handicapped females. Information is needed in determining the effectiveness of the sensory aid if the sex of the participant is different.

Thus the need for data based research addressing the questions raised above remains unanswered. As information is gathered the visually impaired child may be able to perform and develop his/her maximum physical abilities.
Selection of Subject Population

The subjects included 40 female and 40 male visually handicapped individuals aged 6-21 from Batavia School for the Blind, Batavia, New York; Jefferson High School in Rochester, New York; School #5 in Rochester, New York; School #84 in Buffalo, New York; Helen Keller School in Newark, New Jersey; and Perkins School for the Blind in Watertown, Massachusetts. All of the above mentioned sites, excluding School #84 in Buffalo, New York, provided institutional or departmental consent for utilization of the facilities and individuals for this study. A parental consent form was required by School #84 and a copy of the form used may be found in Appendix C.

Design

This study utilized a 2 x 2 factorial design with sex having two levels (female and male) and sensory aid having two levels (auditory and tactual).

The subjects were blocked according to sex and then randomly assigned to one of two treatment conditions. Subjects assigned to treatment one ($T_1$) performed in a timed 40 yard dash with the use of an audible goal locator. Subjects assigned to treatment two ($T_2$) performed the same
timed 40 yard dash with the aid of a tactual guide wire. The timed performance scores were recorded for each of the subjects to the nearest tenth of a second. Analysis of variance was utilized in evaluating the significance of any main or interactive effects for the variables.

Method

Facility. The facility utilized was an outdoor black-top cement area, large enough to conduct the 40 yard dash with adequate space for the subjects to stop. This area was free from unnecessary activities, noise, or additional people not utilized in the testing procedures.

Experimental Conditions. Each testing session involved two timers and the researcher. Timer one (Tm₁) was stationed at the start of the event for the sole purpose of timing. Timer one started his/her watch upon the command of the researcher and stopped the watch upon a hand signal given by timer two.

Timer two (Tm₂) was stationed at the finish line of the dash for the purpose of timing. Timer two started the watch upon a hand signal given by the researcher and stopped the watch when the subject crossed the finish line. Timer two also utilized a hand signal signifying to Tm₁ that the subject has completed the run. The subject was also informed by Tm₂ that he/she had reached the end of
the dash, to slow down.

The researcher conducted each testing session and therefore was the only individual to interact with each subject during the testing. The exact procedures followed during the testing are found in Appendix D. A preliminary investigation conducted to assess the effectiveness of the experimental procedures is found in Appendix E. The data recording sheet and raw data gathered from the preliminary investigation, can be found in Appendices F and G. The researcher utilized a clipboard containing a data recording sheet. The two times established by the timers were independently collected by the researcher and a mean score was recorded. A copy of the primary investigation data recording sheet can be found in Appendix H.

After each subject was tested individually, he/she was escorted back to a separate area to prevent subjects from interacting with other testees.

Statistical Procedures

The mean score from the times recorded, was computed for each subject. This represented the actual time recorded for that subject and is the time entered in the raw data for each subject. The raw data for the 80 subjects can be found in Appendix I. A factorial analysis of variance was used to analyze the data. Prior to statistical analysis,
two scores which were greater than two standard deviations from the mean were removed from the data analysis. This common procedure follows the suggestion of Winer (1971) and other statisticians in order to insure representative treatment assessment. The times removed were 76 seconds and 94 seconds both of these times came from female subjects in the tactual condition (X = 11.12 sec.).
The major purpose of this investigation was to determine if the timed performance scores of visually handicapped individuals participating in a 40 yard dash, are significantly influenced by the sex of the subject or the type of sensory aid utilized during the running. The subjects were 40 female and 40 male visually handicapped individuals attending various schools and institutions in Massachusetts, New Jersey, and New York. Those participating were classified as legally blind individuals, constituting both totally blind and partially blind individuals. The subjects ranged in age from 6-21 years. Subjects were blocked according to sex and randomly assigned to one of two treatment conditions. Subject assignment was determined by using a table of random numbers insuring uniformity of subject representation in each treatment condition.

The design was a 2 x 2 factorial design with sex and sensory aid having two levels. The aids consisted of an audible goal locator and a tactual guide wire. Those randomly assigned to the first treatment condition utilized the audible goal locator. The device was stationed 50 yards from the starting line directly facing the runner with frequency set at 8 KHz., emissions at 250 pulsations per minute,
and volume at 100 Db., throughout the testing (Chalmers, Note 2; Cratty, 1971; Wever, 1949). Those subjects assigned to the second treatment condition utilized a tactual guide wire. This apparatus consisted of a cord running 50 yards in length at a height of 33" from the ground. A plastic handle, which fit over the cord, was grasped by the subject while running. The testing was administered outside on blacktop or hard cement surface. Each subject was given one trial run utilizing the sensory aid assigned, before the actual time was recorded. The effectiveness of the two aids were evaluated for both female and male subjects through timed performance scores recorded by two independent timers. The times were recorded to the nearest tenth of a second. A mean time was derived from the two independent timers and constituted the actual performance score recorded for that subject. The descriptive data of the study is presented in Table 2.

Table 2
Descriptive Data

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>( \bar{X} ) Time(^a)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females - Audible Goal Locator</td>
<td>20</td>
<td>9.53</td>
<td>2.27</td>
</tr>
<tr>
<td>Females - Tactual Guide Wire</td>
<td>20</td>
<td>11.12</td>
<td>4.63</td>
</tr>
<tr>
<td>Males - Audible Goal Locator</td>
<td>20</td>
<td>8.38</td>
<td>2.90</td>
</tr>
<tr>
<td>Males - Tactual Guide Wire</td>
<td>20</td>
<td>7.65</td>
<td>1.93</td>
</tr>
</tbody>
</table>

\(^a\) Time is in seconds, rounded to the nearest hundredth
An analysis of variance was utilized to test for any significance of main or interactive effects. The results of this analysis is presented in Table 3.

Table 3

Analysis of Variance of Sex and Sensory Aid

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aid</td>
<td>110.421</td>
<td>2</td>
<td>55.211</td>
<td>5.713</td>
</tr>
<tr>
<td>Sex</td>
<td>3.698</td>
<td>1</td>
<td>3.698</td>
<td>0.383</td>
</tr>
<tr>
<td>2-Way Interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aid x Sex</td>
<td>106.724</td>
<td>1</td>
<td>106.724</td>
<td>11.049a</td>
</tr>
<tr>
<td>Error</td>
<td>734.515</td>
<td>76</td>
<td>9.665</td>
<td></td>
</tr>
</tbody>
</table>

a $p \leq .001$, all other F's are nonsignificant at $p \leq .05$.

The F of .383 identified no significant main effect for the type of sensory aid employed by participants running the 40 yard dash. This finding confirmed research hypothesis one. That is, although both aids enabled visually impaired individuals to safely participate in the running of the dash, no significant difference, solely on the basis of sensory aid, was determined when analyzing the timed performance scores recorded for those individuals using the tactual guide wire as compared to the audible goal locator.

The present research does not support the findings of
Morris, Nolan, and Phelps (1973) concerning the academic performances of visually handicapped individuals utilizing both auditory and textural materials. Their research consisted of administering both recorded (auditory) and textural materials to 56 visually handicapped subjects in grades 5-12, in the areas of English, Language, Math, Physical Science, and Social Studies. Although no significant difference was found in the quality of learning, the auditory modality proved 155% to 360% more efficient that information transmitted through the textural modality in the non-physical settings.

A significant (p≤.001) main effect for the sex factor indicated that visually handicapped males had significantly faster timed performance scores than visually handicapped females. The second null hypothesis was thus rejected. It stated that there would be no significant difference in the timed performance score of visually handicapped male subjects participating in a 40 yard dash when compared to visually handicapped female subjects.

The second research hypothesis was supported. This hypothesis stated that the visually handicapped males participating in a 40 yard dash will have significantly faster timed performance scores when compared to visually handicapped females participating in a 40 yard dash regardless of the sensory aid utilized when running.
The significant effect for sex support's Buell's findings (Note 1) that visually handicapped boys generally exceed performance levels of visually handicapped girls. Some reasons presented by Buell for sex differences include: (1) special schools usually provide better physical education programs for boys than they do girls, (2) the boys are usually given more athletic equipment and permitted to use more playground area, (3) more time is devoted to boys physical activity classes than to those for girls, (4) visually handicapped boys are more active than girls, (5) through observation, it was noticed that blind girls are usually more restrained than boys without vision.

The research also supports Buell's findings where he compared visually handicapped males and females to sighted peers. He found that the running performance of visually handicapped boys more nearly approached the norms for the seeing that the average score of girls with defective vision. The Iowa Brace Test and American Association for Health, Physical Education, and Recreation (AAHPER) Youth Fitness Test achievement scales established for sighted individuals were used in the comparison. On these tests it is also noted that normally sighted males perform faster than normally sighted females in the running of a 50 yard dash.

No statistical significance for the interaction of sex and sensory aid was found. This prevented the rejection of
third null hypothesis. This hypothesis stated that no significant interaction would be established for the variables of sex and sensory aid utilized in the running of a 40 yard dash by the visually handicapped. Examination of the mean scores presented in Table 2 indicate that the visually handicapped females performed slightly faster using the audible goal locator \((\bar{X} = 9.53)\) as compared to the tactual guide wire \((\bar{X} = 11.12)\). The visually handicapped males, however, seemed to perform slightly faster when utilizing a tactual guide wire \((\bar{X} = 7.65)\) as compared to the audible goal locator \((\bar{X} = 8.38)\). The direction of these mean scores however, are in opposition with the predicted research hypotheses. Why this has occurred is unclear. The complexity of the task itself, may have been a factor that influenced the nonsignificant finding of both the interaction and main effect for sensory aid. Since the gross motor skill of running has minimal physical complexity, the use of either sensory aid may be irrelevant to the performance of the subjects. Increasing the complexity of the task such as performing a shuttle run or cross-country running, may produce additional findings of sensory aid effectiveness or significant interactions of sex and aid. Further testing is needed along with statistical findings before a valid explanation can be attempted.

In summarizing the results of the present study, it
appears as though the sex significance may be attributed to two possibilities. The first being that in normal progressions of physical/motoric development, the visually handicapped male between the ages of 6-21, physiologically and/or anatomically performs significantly better than the visually handicapped female of the same age in the running of a 40 yard dash (Astrand, & Rodahl, 1970). The other possibility may be due to the differential socialization hypothesis suggested by Buell (Note 1).

Although all the subjects participating in this study were receiving physical education as a part of their total educational program, vigorous physical education and athletics for visually handicapped females is still in its beginning stages in both residential and public schools. The new legislations of Title IX and P.L. 94-142 however, increase the opportunities for visually handicapped females in physical education programs and athletics. Further research at a later date, may indicate whether such a significant difference in the performance of visually handicapped females, was due to physiological/anatomical supremacy of males participating in a 40 yard dash, or a developmental lag in visually handicapped females due to limited physical education and athletic experiences in the past.

Since no significant difference for the interaction of sex and sensory aid or main effect for sensory aid was found, it would appear that a participant would not be at a
disadvantage by choosing either device when participating in the running of a 40 yard dash. It can therefore be suggested, that the option can be given to the visually handicapped participant in terms of his/her personal preference in utilizing the audible goal locator or tactual guide wire when participating in a 40 yard dash.
Chapter V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

SUMMARY

The purpose of this experiment was to determine if visually handicapped subjects utilizing sensory aids when running a 40 yard dash, significantly differ in the timed performance scores recorded as a function of sex or type of sensory aid employed.

The subjects were 40 visually handicapped females and 40 visually handicapped males from various institutions and schools in Massachusetts, New Jersey, and New York. The subjects ranged from 6-21 years of age. The subjects were blocked according to sex and randomly assigned to one of two treatment conditions. Those subjects assigned to treatment one utilized an audible goal locator when running. Those assigned to treatment two, ran with the aid of a tactual guide wire. Each subject was given one trial run utilizing the device assigned, before the timing occurred.

The researcher conducted each testing session outside on a blacktop or hard cement surface with the aid of two timers. These two timers provided two independent times for each subject from which a mean time was derived. One timer was positioned at the start of the dash, the other at the finish line.
The study utilized a 2 x 2 factorial design. The independent variables were sex and sensory aid and the dependent variable was timed performance on a 40 yard dash. An analysis of variance was utilized to evaluate the significance of any main and interactive effects of the variables.

The results shown in Table 3 indicated that a nonsignificant F of .383 was found for sensory aid. This finding followed the first predicted research hypothesis. It was determined through the research that the use of either sensory aid would facilitate the safe participation of visually handicapped individuals in a 40 yard dash.

A significant (p < .001) main effect for sex was found. This allowed for the rejection of the second null hypothesis which stated that visually handicapped males will not perform significantly faster than visually handicapped females in a 40 yard dash. The second research hypothesis was therefore accepted for the study. This finding was discussed in terms of a possible developmental lag in females as a function of differential socialization or a physiological/anatomical supremacy of males, in terms of running performances.

The interaction of sex and sensory aid was found to be nonsignificant at the .05 level. However, a mean examination of scores presented females performing faster with the use of an audible goal locator and males performing slightly faster utilizing the tactual guide wire.
CONCLUSIONS

Based on the results of the present study the following conclusions were made:

(1) Visually handicapped individuals using a tactual guide wire when running a 40 yard dash, did not significantly differ from those individuals utilizing an audible goal locator.

(2) Both sensory aids enabled visually handicapped individuals to safely participate in the running of a 40 yard dash.

(3) Visually handicapped males performed significantly faster (p < .001) in a 40 yard dash as compared to visually handicapped females.

(4) The present research confirms Buell’s finding (Note 1) of significant sex difference of visually handicapped males performing significantly faster than visually handicapped females in a 50 yard dash.

(5) The interaction of sex and sensory aid was found to be nonsignificant.

RECOMMENDATIONS

Based upon the present study the following recommendations were made:

(1) Data based research in the area of physical education for the visually handicapped is greatly needed and should be continued in all areas of physical performance.
(2) Further research pursuing the possible effects of sex, sensory aid, and physical setting should be conducted. Some suggested ways are:

(a) Increase the physical complexity of the running skill.
(b) Narrow the ages of visually handicapped subjects utilized, to a range of five years.
(c) Modify and/or expand the tactual and auditory aids used.
(d) Adapt the present research utilizing the two sensory aids to other physical skills.

(3) A longitudinal study should be conducted to determine if visually handicapped females performed slower due to a developmental lag or male supremacy in running activities.

(4) The choice of either sensory aid in the running of a 40 yard dash should be left up to the personal preference of the visually impaired individual participating.

(5) Conduct a study to determine if changes in the tone, volume, or frequency of the audible goal locator can significantly effect the performance of visually handicapped individuals.
APPENDIX A

AUDIBLE GOAL LOCATOR
AUDIBLE GOAL LOCATOR
APPENDIX B

TACTUAL GUIDE WIRE
TACTUAL GUIDE WIRE
APPENDIX C

BUFFALO PARENTAL CONSENT FORM
June 28, 1979

Dear Parent:

I am a graduate student at the State University of New York College at Brockport in Adapted Physical Education. Through my studies and research, I have become interested in knowledge concerning the visually handicapped student in physical education. It is my wish to contribute in aiding visually handicapped students increase their performance and mobility in this area.

I am conducting a study concerning the timed performance scores of visually handicapped males and females, participating in a 40 yard dash. Two devices will be utilized during the running. One device will be an audible goal locator or beeper, the other a tactual guide wire. It is hoped that the results of this study will help in determining which device better aids the visually handicapped child participate in a running event.

I would appreciate your permission in helping me discover which device would best aid your son or daughter who, after consent, will participate in my study.

No names will be used at any time during this event or upon completion of the research.

At no time will there be any danger involved. Seventy one visually impaired children have already been tested from New York, New Jersey, and Massachusetts areas. The conditions and procedures are quite simple, safe, and
enjoyable themselves, for the children to participate in.

If for any reason, your child may not desire to participate on that day, his/her rights will be honored and he/she will be free to drop out at any time.

The study will take place at School #84 in Buffalo, on Thursday, July 5, 1979, under the permission and supervision of the school and Ms. Margret Spitler.

I hope this study will aid in establishing greater insights to benefitting the visually handicapped perform more safely and efficently in future physical education programs.

Thank you for your cooperation.

Sincerely,

Bonnie Chalmers

For any information or questions, please feel free to contact me at:

Bonnie Chalmers
Graduate Fellowship Student
Physical Education Department
SUNY College at Brockport
Brockport, New York 14420

or call me at [redacted]

CONSENT FORM

I give permission for my son/daughter to participate in your study.

Parental Signature

* Please return this form to School #84 before or by July 5, 1979.
Testing Procedures

Researcher approaches subject.

"Hi! My name is Bonnie, you'll be working with me for a little while today. Please, come with me as I tell you what we'll be doing."

Walks over to testing area, subject at side.

"What we're going to do today, is to see how fast you can run a 40 yard dash. Are you a fast runner? Well, today when you run, you'll be using (an audible goal locator or beeper which is a device which makes a beeping sound) a tactual guide wire to hold onto. This will help you to run in the right direction."

Arrive at the starting line.

"There is a person up here at the start with me and another person at the finish line straight ahead. These people will be timing you when you run. There is nothing at all in front of you, so there's plenty of open space to run. The first time I'd like you to just jog down to the end (listening to the beeper) holding onto the guide wire. We won't time you until the second time you run. The first time is just so you can get used to running (to the beeping sound) holding onto the guide wire. The person at the finish line will tell you when you're at the end. He/she will then tell you to turn around and walk back up here to the start. The second time, you will run as fast as you can
and we will time you. Do you have any questions? (I am now
going to turn on the beeper so you can hear how it sounds)
Here is the guide wire that you will be using, this is the
handle and it runs all the way down to the end."

Signals person at the finish line to turn on beeper.

"Now, as soon as I say "Ready, Set, Go", I'd like
you to just jog down to the end (listening to the beeper)
holding onto the guide wire. Okay? Ready, Set, Go."

Subject jogs to end, is told to slow down by person
at the finish line, and told to turn around and walk back.
Timer two also turns off the beeper.

"Nice jog. Now walk up here towards me. That wasn't
too hard, was it? Well, this time when I say ready, set,
go, I'd like you to run as fast as you possibly can (to the
beeper) holding onto the guide wire. This time we will
time you to see how fast you can run. Do you have any
questions? Okay, We'll start you right here."

Lines up subject to starting line.

"Now remember as soon as I say ready, set, go, run
as fast as you can to the end. Don't slow down until you hear
the person at the end tell you to, okay?"

Signals for beeper to be turned on or places subject's
hand on the handle of the guide wire. Researcher then places
one arm up in the air.

"Ready, Set, Go!"

On go, researcher forces arm to thigh, signifying the
start of the run to Timer two. Timer two then does the same for Timer one, signifying that the subject has crossed the finish line. Timer two also tells the runner to slow down and walks up with him/her to meet the researcher coming down.

"Very nice run! Thank you very much for all your help. You ran very well! Did you enjoy running today?"

The subject was then escorted away from the testing area to a separate area. The researcher then collected the times recorded from the two timers, independently. These two times were entered on the data recording sheet and a mean time, or actual time, was recorded.
APPENDIX E

PRELIMINARY INVESTIGATION
Preliminary Investigation

AN EXPERIMENTAL STUDY OF THE TESTING PROCEDURES
ESTABLISHED FOR THE RUNNING OF A 50 YARD DASH
UTILIZING AN AUDIBLE GOAL LOCATOR AND A
TACTUAL GUIDE WIRE WITH VISUALLY
HANDICAPPED MALES AND FEMALES.

Purpose of the Preliminary Investigation

The purpose of the preliminary investigation was to
evaluate the testing procedures established for a proposed
master's thesis. The following procedures were evaluated
during the preliminary investigation: instruction, estab-
lishment of the treatment conditions, examination of the two
sensory aids utilized, and the procedures established for
the independent collection from two timers.

Selection of Subjects for the Preliminary Investigation

The subjects were fifteen undergraduate volunteers
enrolled in an adapted physical education course at the
State University of New York College at Brockport during
the Spring 1979 semester. The subjects were informed that
they were participating in a pilot study designed to examine
the procedures and conditions established for use in a
master's thesis project concerning visually impaired
individuals.
Procedures for the Preliminary Investigation

The subjects were grouped in twos with one subject blindfolded while the other served as a guide. The subjects entered the gymnasium and were then escorted over to the treatment condition assigned by the researcher, who conducted the actual testing. The exact procedures followed are found in Appendix D. The facility utilized for the preliminary investigation consisted of two adjacent gymnasiums at the State University of New York College at Brockport. The two dashes were measured and marked for each treatment condition, crossing the two gymnasiums at a diagonal. This enabled the distances of the two dashes to measure 40 yards. This provided adequate room for the starting and stopping of the running event.

The tactual guide wire utilized was a 67 yard long, ¼" diameter, nylon rope. This was tied onto two volleyball standards and measured 33" above the floor. The first standard was placed at the starting line, the second was placed near the wall, at the end of the dash. This allowed for adequate space to slow down and stop after crossing the finish line. A 10" plastic hose, measuring ½" in diameter was placed over the nylon rope and utilized as a guide for the runner to hold as he/she ran the dash.

The audible goal locator was placed 50 yards from the starting line, adjacent to the tactual guide wire. The lo-
cator was positioned facing the runner with frequency held constant at \( \frac{1}{2} \) the range, pitch at the lowest range, and volume at \( \frac{1}{2} \) the maximum.

The gymnasiums were closed to all other personnel and free from unnecessary noise, activity, or individuals not utilized in the preliminary investigation.

Four individuals were utilized in the testing procedures. The researcher conducted the experiment and gathered the data from the two timers. The timers measured the performances of the dashes. One was positioned at the beginning of the dash, the other at the finish line. The fourth person was utilized for safety reasons in stopping the individuals at the end of the dash with verbal and physical cues.

Data Collection and Analysis for the Preliminary Investigation

The researcher collected the times independently from each timer. Each subject's time was then recorded on the data recording sheet. The recording sheet is found in Appendix F. Upon completion of the preliminary investigation, mean (\( \bar{X} \)) times were recorded for each subject. Each subjects' time was derived from the two independent times gathered. The results of the data are presented in Table 1.
Table 1
Data Analysis of the Preliminary Investigation

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>$\bar{X}$ Time$^a$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females - Audible Goal Locator</td>
<td>3</td>
<td>10.70</td>
<td>3.03</td>
</tr>
<tr>
<td>Females - Tactual Guide Wire</td>
<td>3</td>
<td>8.23</td>
<td>.06</td>
</tr>
<tr>
<td>Males - Audible Goal Locator</td>
<td>4</td>
<td>8.05</td>
<td>1.11</td>
</tr>
<tr>
<td>Males - Tactual Guide Wire</td>
<td>5</td>
<td>9.46</td>
<td>1.64</td>
</tr>
</tbody>
</table>

$^a$ Time is in seconds, rounded to the nearest hundredth

Results of the Preliminary Investigation

The results of the preliminary investigation indicated that the procedures and conditions established for the master's thesis are feasible for the study. Minor revising indicated by this testing are discussed below.

(1) The two standards utilized, were not sturdy enough to support the rope for that condition. Timer 1 was therefore stationed standing on the first standard while timing, to prevent the standard from falling over.

(2) The audible goal locator was discovered to have produced adequate pitch, volume, and frequency for those subjects participating under that treatment condition.

(3) An additional person was needed to provide verbal
and/or physical cues to the subjects after both the trial and timed runs. This person also was needed to provide adequate feedback to the runner enabling the subject to return to the start of the dash, after the initial trial.

(4) The scores recorded independently by the two timers revealed close similarities. The average time differences were two tenths of a second, providing reliable data collection and measurement.

(5) The researcher noted that additional verbal cues were necessary to provide more adequate information and feedback to the subject. For example, additional instructions on returning after the first trial and reassurance of the safety implications. Such supplementary verbal cues would permit more systematic and feasible conditions.

(6) The established distance of the dash was set at 50 yards. However, this distance was not feasible utilizing the indoor facility. A 40 yard dash was therefore substituted, providing adequate distance needed for the proper testing conditions.

Conclusions of the Preliminary Investigation

Based on the results established from the preliminary investigation, the following recommendations were made:

(1) The distance of the dash will be changed from 50 to 40 yards.

(2) The tactual guide wire utilized will be either
lighter in weight or anchored to a more sturdy framework.

(3) The utilization of another person in each of the testing sessions will be added. He/she will be utilized for safety reasons and providing needed verbal and/or physical cues to the subjects at the finish line.

(4) The exact calculations of the audible goal locator will be determined for pitch, frequency, and volume.

(5) Additional verbal instructions will be added to the testing procedures. These will include safety reassurance, additional feedback verbally to enable the subject to return to the start after the first trial, and cues from the person positioned at the finish line to provide needed information concerning the end of the dash.
APPENDIX F
PRELIMINARY INVESTIGATION
DATA RECORDING SHEET
Preliminary Investigation

Data Recording Sheet

The data recording sheet presented in Appendix F is interpreted as follows:

**Subject number.** Represents the number assigned to that particular subject.

**Sex.** Represents either a 1 for female or a 1 for male.

**Aid.** Represents either a 1 for audible goal locator or a 2 for tactual guide wire.

**Columns under Tm₁.** Represents the time recorded in the 40 yard dash by timer one. The first two columns represent the minutes, the third column represents the tenth of a second.

**Columns under Tm₂.** Represents the time recorded in the 40 yard dash by timer two. The first two columns represent the minutes, the third column represents the tenth of a second.

**Columns under \( \bar{X} \text{Tm.} \)** Represents the mean (\( \bar{X} \)) or average of the two times recorded. This was recorded as the actual time in seconds for that subject in the raw data information.
### Preliminary Investigation Data Recording Sheet

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APPENDIX G

PRELIMINARY INVESTIGATION

RAW DATA
The raw data presented in Appendix G is interpreted as follows:

Columns 1 and 2. Represents the subject's number.

Column 3. Identifies the sex of the visually handicapped subject. The number 1 in column three represents a female subject. A 2 in column three represents a male subject.

Column 4. Identifies the treatment condition or sensory aid utilized by the subject. The number 1 in column four represents the use of an audible goal locator. A 2 in column four represents the use of a tactual guide wire.

Columns 5, 6, and 7. Represents the time recorded in the 40 yard dash. Columns five and six represent the seconds, column seven represents the tenth of a second. ($\bar{X}$ of two times taken.)
Preliminary Investigation
Raw Data

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0 5 2 2 0 9 2
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1 2 2 2 1 2 2
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APPENDIX H
PRIMARY INVESTIGATION
DATA RECORDING SHEET
Primary Investigation
Data Recording Sheet

The recording sheet presented in Appendix H is interpreted as follows:

**Subject number.** Represents the number assigned to that particular subject.

**Sex.** Represents either a 1 for female, or a 2 for male.

**Aid.** Represents either a 1 for audible goal locator or a 2 for the tactual guide wire.

**Columns under Tm₁.** Represents the time recorded in the 40 yard dash by timer one. The first two columns represent the minutes, the third column represents the tenth of a second.

**Columns under Tm₂.** Represents the time recorded in the 40 yard dash by timer two. The first two columns represent the minutes, the third column represents the tenth of a second.

**Columns under \( \bar{X} \) Tm.** Represents the mean (\( \bar{X} \)) or average of the two times recorded. This was recorded as the actual time in seconds for that subject in the raw data information.
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APPENDIX I
PRIMARv INVESTIGATION
RAW DATA
Primary Investigation
Raw Data

The raw data presented in Appendix I is interpreted as follows:

Columns 1 and 2. Represents the subject's number.

Column 3. Identifies the sex of the visually handicapped subject. The number 1 in column three represents a female subject. A 2 in column three represents a male subject.

Column 4. Identifies the treatment condition or sensory aid utilized by the subject. The number 1 in column four represents the use of an audible goal locator. A 2 in column four represents the use of a tactual guide wire.

Columns 5, 6, and 7. Represents the time recorded in the 40 yard dash. Columns five and six represent the seconds, column seven represents the tenth of a second. (X of two times taken.)
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REFERENCE NOTES


2. Chalmers, B.L. Preliminary Investigation: An experimental study of the testing procedures established for the running of a 50 yard dash utilizing an audible goal locator and a tactual guide wire with visually handicapped males and females. Unpublished manuscript, State University of New York College at Brockport, 1979.


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Balmer, L. A guidance device for a blind athlete. Medical and Biological Engineering, April 1970, 8, 301-307.


