THE EFFECTS OF EDUCATIONAL KINESIOLOGY AND FUNCTIONAL VISUAL EFFICIENCY ON TYPEWRITING SPEED AND ACCURACY

by

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(ABSTRACT)

The Employment Training Program has been mandated by the Federal Government to train and find unsubsidized employment for economically disadvantaged individuals and others facing serious barriers to employment. Keyboarding skills are of paramount importance in the clerical program.

This study was undertaken to determine the effect of educational kinesiology on typewriting speed and accuracy for students with and without functional visual efficiency. It involved 75 subjects from the Employment Training Center (JTPA Program) in Arlington, Virginia.

Typewriting pretests were administered to determine subjects speed and error averages. Eye screening was administered utilizing the Titmus Vision Tester and the King-Devick Saccade Test. Although the battery of tests for the Titmus were administered, only the lateral and vertical phoria near test that measures muscle balance, the relationship of the image of each eye to that of its fellow,

provided meaningful data for this study. The K-D Test measures tracking ability of the eyes as they perceive copy for typewriting. Subjects were considered as functionally visually efficient by passing both vision tests.

The concepts of educational kinesiology (education through movement) were explained to the subjects as a way to increase typing speed, reduce errors, and control stress. Volunteers for the training numbered 31; 44 subjects remained in the control group.

The same straight-copy timed writing was used for the pretest and posttest. Analyses of variance were used to examine differences in pretest and posttest scores for both speed and accuracy.

Some of the major findings of the study were as follows:

1. Training in educational kinesiology had no effect on typewriting speed and accuracy.

2. Functional visual efficiency had no effect on typewriting speed and accuracy.

3. No interaction exists between the typewriting pretest-posttest speed and accuracy scores for students who did and did not receive educational kinesiology training and for students with and without functional visual efficiency.

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Chapter 1

OVERVIEW OF THE STUDY

While typing skill, now called "keyboarding," involves visual, manual, and mental discipline, the visual skills development is often ignored. This study examines the effect of educational kinesiology training on keyboarding skills development for students with and without functional visual efficiency.

Clerical Employment in the Washington Metropolitan Area

There has been a shortage of skilled clerical personnel in the Washington Metropolitan Area as well as in other cities in the United States during the past decade. In order to attract qualified office personnel, employers have been willing to increase salaries and benefits. One of the skills businesses do, however, require applicants for office positions to have is good keyboarding ability. For anyone with competent clerical skills and a conscientious work ethic, job security seems assured.

To provide formal occupational training for office positions to meet the demand in the Washington Metropolitan Area, the Arlington Employment Training Program (Job Training Partnership Act Program), offers instruction and

hands-on experience in office technology to students for a period of 18 to 24 weeks in an open-entry, open-exit program. The challenge is to provide students with effective career preparation in the shortest amount of time and to provide employers with the best possible job-ready candidates.

Speed and accuracy in timed writings as well as communication skills are the major criteria used to screen potential candidates for employment in the clerical field in the Washington area. The problem of typewriting with accuracy has been a stumbling block for many JTPA students. Excessive typewriting errors (eight or more) on a 5-minute timed writing often preclude applicants from being considered as a typist by many employers.

Frequent calls are received by the job developers and instructors at the Employment Training Program in Arlington from prospective employers regarding available clerical positions. Current employment files as well as the newspaper advertisements reveal that positions as typists and word processors require typing speeds ranging from 45 to 70 words per minute for business organizations and industries throughout the Washington Area. Temporary agencies also have stringent typewriting requirements. For example, Norrell Temporaries requires clerk/typists and word processors to have from 50 to 90 words per minute with no

more than 8 errors in 5 minutes. Temporaries assign people who type fewer words per minute and who have more than 8 errors on 5-minute timed writings to light typing (envelopes, memos, requisitions, etc.) positions. This is a financial loss to employees in that it means the difference of $5 to $8 per hour.

The Federal Government standards for employment as a clerk/typist are on a graduating scale. Minimum requirements listed by the Office of Personnel Management are shown on the following chart:

GS-2/3	GS 4/5
40 wpm with 3 errors	40 wpm with 3 errors
45 wpm with 5 errors	45 wpm with 4 errors
50 wpm with 6 errors	50 wpm with 5 errors
55 wpm with 8 errors	55 wpm with 7 errors
60 wpm with 9 errors	60 wpm with 8 errors
65-70 wpm with 10 errors	65-70 wpm with 9 err.

Job Training Partnership Act

The mission of adult vocational education under the Job Training Partnership Act (JTPA), P.L. 97-300 of 1982, is to enhance the employability of citizens, promote the economic growth of the community, and maximize the value to employers of local labor market resources by providing well-balanced, innovative employment and training programs. JTPA has been mandated by the federal government to establish programs to prepare youth and unskilled adults for entry into the labor force. It provides job training to economically disadvantaged individuals and others facing serious barriers

to employment to assist them in obtaining productive employment. The term disadvantaged is generally used to identify those who have cultural, educational, emotional, or economic problems that prevent them from participating in full employment.

Funding for JTPA has averaged around $3.5 billion per year since the inception of the preparation-for-work program. Performance standards are developed by the Secretary of Labor and stipulate for adult training programs that there must be an increase of employment, earnings, and a reduction in welfare dependency for students completing the program. These criteria are met by placing a student in unsubsidized employment, with an increase from previous earnings, by the providing agency (National Commission for Employment Policy, 1987).

Overview of Visual Efficiency

Recent research involving the multisensory approach to information acquisition indicates that vision is by far the dominant sensory modality used in learning (Barraga, 1969; Jan, Freeman, & Scott, 1977; Posner, Nissen, & Klein, 1976; Wertenbaker, 1981).

Barraga (1973) explains that vision is divided into two types: central (macular) and peripheral. The central vision is needed for detecting fine detail whereas the peripheral vision is more important for traveling across the

page. The true visual system is when the central vision and periphery interrelate. The total visual system encompasses much more than the single organ of the eye but is rather "a process of coordinating the organ parts and the muscles to work in harmony in both eyes (binocularly), a most complicated phenomenon. Through the optic nerve the messages proceed to the brain for coding, organization, and interpretation" (p. 122).

Visual acuity refers to the ability to discriminate fine details at a distance; however, many specialists consider the term visual efficiency to be more inclusive. Eyes should move and work as a team, as though they were just one eye. This requires perfect coordination and synchronization of the 12 eye muscles. Both eyes see separate images which are carried along the optic nerve to the brain to be formed together (fused) into one mental picture. This fusion makes normal three-dimensional vision, known as stereopsis, possible. If the brain cannot fuse the images from both eyes, three-dimensional vision and depth perception are affected (Barraga, 1973; Wertenbaker, 1981).

McPartland (1985) explains that 20/20 is not synonymous with perfect vision. He states that "the terms binocularity and fusion typically refer to an individual's ability to use both eyes efficiently and simultaneously. When efficient binocularity is lacking, doubling of vision or blurring of

print may be noted, which can affect performance and comprehension" (p. 156). When the eyes focus from far vision to near placement, the term accommodation is used. "The inability to focus the eye lens through weak eye muscle control may result in an inability to sustain visual attention on prolonged seat work" (p. 157). Errors in copying from chalkboard to paper or book to typewriter may be the result.

McConkie and Zola (1984, pp. 3, 15) became involved in eye movement research and investigated the nature of forward saccadic eye movements in reading. The researchers found that during reading the eyes execute a rapid series of saccadic eye movements, that occur at the rate of three or four per second, with each saccade taking the eyes to a different location and providing the reader with a clear perception of a new region of text. The conclusion was that the reader sends his/her eyes to the next unidentified word with location preferences in the word being a complex function of length and distance.

A number of researchers have investigated eye patterns in relation to typewriting speed and accuracy. Butsch (1937), Fuller (1943), and West (1984) reported that the eye movement patterns in typing were different from those when reading, with the former containing more and longer eye fixations than the latter. Most researchers have agreed

with Butsch (1937) that in typewriting "the eye-hand span emerges because the eye keeps far enough ahead to provide copy for the hand as needed" (p. 23). Fuller (1943) defined eye-hand span as "the amount of material intervening between the character receiving the attention of the eyes and the character whose key is currently being pressed, and ranges between three and seven characters for average to excellent typists" (p. 19). Fuller stated that "the reading rate for ordinary reading is about 5.7 times the reading rate for typewriting. Typing shows a sizeable increase in fixations and regressions, and in the length of time for each pause as well as a sizeable decrease in reading rate and eye-span over ordinary reading" (p. x).

Since perception of copy is vital to output of copy, it should follow that if binocular (contralateral) vision is being utilized effectively by students, typewriting speed and accuracy should improve.

NEED FOR STUDY

The typographical error is still one of the greatest problems for the typist. Inability to type accurately during the preemployment testing on 5-minute timed writings results in a lost opportunity for a clerical position as a typist as well as a loss in higher wages.

Recent research studies have delved into the employment

testing procedures confronting secretarial students entering the job market. Merrier (1983) completed a study on preemployment testing for word processing for businesses and organizations located in the Midwest. Typewriting timings of 5 minutes and grammar tests were the two most frequently administered by the organizations surveyed. One recommendation resulting from Merrier's study was for business educators to provide students with the opportunity to measure their skill consistently on 5-minute timed writings. A study completed by Ettinger (1982) concluded that accuracy in typewriting is the primary skill considered important for correspondence secretarial positions and for administrative secretarial positions.

This study has been designed to examine factors that might be associated with perceiving copy in such a manner as to incorrectly reproduce it. One such factor noted by Griffin (1981) is "inefficiency in reading due to poor saccadic eye movements, which leads to omission of words, lines skipped, or a frequent loss of place when reading. Excessive head movement can be a common sign for poor saccadic eye movement" (p. 27). The King-Devick Saccade Test, utilized in this study, measures this factor by timing the saccadic eye movements.

STATEMENT OF THE PROBLEM

This study examined the possibility that educational

kinesiology techniques that have been developed by Dennison (1981) and have been acclaimed to improve both hand-eye coordination and to reduce stress will assist students, both with and without functional visual efficiency, to improve keyboarding skills. Dennison's theory (1981, p. 31) is that emotional stress is often the primary factor in muscle imbalances and emotional well-being. A number of activities are used in his program to reduce stress, improve an individuals' self-concept, and promote growth.

In order to explain how educational kinesiology works, Dennison and Hargrove (1985, p. 49), coined three terms to clarify the complex functioning and structure of the brain--laterality, centering, and back/front. An overview of these dimensions would be that the laterality dimension refers to the notion that the brain consists of two sides: the left hemisphere and the right hemisphere. For the most part, the left hemisphere controls the right side of the body, as well as language, arithmetic, and the right visual field. The right hemisphere controls spatial perception, the left visual field, and functions in a gestalt manner as a processor of rhythm, music, and imagination. This dimension affects the ability of the eyes to cross the midline (center) of the body for reading and writing activities.

Dennison and Hargrove's (1985) notion of the centering dimension refers to the organization and coordination of the

body and brain in regard to top-bottom/bottom-top energy flow. To be centered according to E-K theory implies "a sense of balance and overall whole-body coordination in which there is a sense of 'groundedness' and an integrity of the upper and lower halves of the body as they work together" (p. 47). E-K theory suggests that when a student is not "centered," the body's intricate system of (physical) balancing mechanisms get out of alignment and compensations begin to take place through inner ear imbalances or other blockages.

Dennison and Hargrove (1985, p. 48) state that the back to front dimension has to do with concentration, focus, and the ability to retrieve information from the back to the front and to bring information up to the frontal lobes for further processing or expression. If an individual is overfocused, he/she may become so absorbed in the task that it is difficult to keep a total perspective. On the other hand, if underfocused, it may be difficult to concentrate on the task at hand.

Educational kinesiology deals with all of these brain dimensions. Specific exercises, movements, and techniques that Dennison postulates relate to the different dimensions of the brain are applied for whole-brain integration to take place. The E-K exercises are safe, simple, natural movements that have been asserted to promote better

hemispheric integration for the eyes, ears, and body. E-K uses muscle testing to detect energy imbalance. Muscle testing is the art of isolating and testing one muscle at a time to determine energy blockages involved with mental fatigue, emotional stress, sugar metabolism, or food allergies. Appendixes E and F contain some of the movements used in the E-K training class.

This study examined the possibility that Educational Kinesiology techniques that have been developed to improve hand-eye coordination and reduce stress will assist students, both with and without visual efficiency, in reducing errors in typewriting. The null hypotheses tested are stated below:

HO_1 The change in typewriting speed between the pretest and posttest does not differ for two groups of subjects, those who receive educational kinesiology training and those who do not receive the training.

HO_2 The change in typewriting speed between the pretest and posttest does not differ for two groups of subjects, those functionally visually efficient and those functionally visually inefficient.

HO_3 No interaction exists between typewriting pretest-posttest speed scores for subjects who do and do

not receive educational kinesiology training and for subjects with and without functional visual efficiency.

HO_4 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of subjects, those who receive educational kinesiology training and those who do not receive the training.

HO_5 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of subjects, those functionally visual efficient and those functionally visually inefficient.

HO_6 No interaction exists between typewriting pretest-posttest error scores for subjects who do and do not receive educational kinesiology training and for subjects with and without functional visual efficiency.

DEFINITION OF TERMS

Accommodation is the automatic adjustment of the curvature of the eye's lens by contraction or relation of ciliary muscles to bring images from various distances into sharp focus on the retina.

Acuity refers to sharpness of vision.

Binocular vision is a complicated, precise process which is present when all 12 eye muscles are operating normally.

Contralateral refers to that which is located, occurring, or acting in conjunction with a similar part on the opposite side of the body.

Cross-motor patterning is "any rhythmic, balanced movement which requires the individual to dynamically relate the right side of the body to the left side of the body, while at the same time being aware of the top half of the body and the lower half" (Dennison, 1981, p. 37).

Diopter refers to a unit of angular measurement related to the position of the eyes.

Dominant hemisphere relates to the hemisphere that appears to respond more often or appears to be dominating a response to a stimuli (Dennison & Hargrove, 1985, pp. 12-14).

Edu-kinesthetics is "the application of kinesthetics (movement) to the study of right brain, left brain, and body integration for purposes of eliminating stress and maximizing full learning potential" (Dennison & Hargrove, 1985, p. 97).

Educational kinesiology is "the study of the musculature system of the body and its relationship to whole brain learning" (Dennison & Hargrove, 1985, p. 97).

Fixation is a term referring to the act of training one's eyes on an object.

Fusion is the process of combining the two separate images from the two eyes into one complete picture.

Kinesiology is the study of muscles and the science of testing and balancing them to restore equilibrium. Applied kinesiology means that the information from the muscles is applied to the body to assist in better functioning (Jensen & Schultz, 1977, p. 1).

Midline refers to "the line which separates one visual field and hemispheric awareness from the other when there is incomplete integration" (Dennison & Hargrove, 1985, p. 98).

Muscle testing "in educational kinesiology is used for two purposes: (a) to measure the relative strength of a muscle for the purpose of inferring brain functions relevant to educators; (b) to anchor or to reinforce positively all integrated processing" (Dennison & Hargrove, 1985, p. 98).

Ortho-Rater is a stereoscopic vision testing instrument utilized in school vision testing and occupational testing.

Saccades are quick, involuntary eye movements during changes in points of fixation.

Snellen's chart is a chart of block letters of gradually decreasing sizes, used in visual acuity tests, marked according to the distances at which they are normally legible.

Stereoscope is an optical instrument for obtaining from two pictures corresponding to the position of two eyes a single three dimensional image by means of two lenses used one with each eye and set rays coming from corresponding points in the two pictures in such a manner as to produce the effect of originating at a single point.

Stereopsis is the ability to perceive objects as three-dimensional.

Switched off in educational kinesiology refers to "the involuntary inhibition of one cerebral hemisphere in order to better access the other; usually due to stress or lack of efficient visual integration" (Dennison & Hargrove, 1985, p. 98).

Visual field is the entire expanse of space visible at a given instant without moving the eyes.

Visual system is the pathway of sight from the eye to the brain.

STUDY ORGANIZATION

Chapter 1 provided an overview of the study. Chapter 2 discusses the literature. Chapter 3 details the research and data collection procedures. Chapter 4 presents the results of the evaluation and data analyses, and Chapter 5 presents conclusions and recommendations based upon the research findings.

DELIMITATIONS OF THE STUDY

The results of this study have been delimited to a small sample of JTPA students. Data have been confined to limited vision testing for diagnostic purposes only and an eye tracking test. The larger area of concern for fine motor-skill coordination has not been included.

Many of the subjects in the sample are from foreign countries and have strong cultural and religious biases. Educational kinesiology training was explained and the purpose for which it was being used; i.e., to assist students to reduce errors and to reduce stress in typewriting on 5-minute timed typewriting tests.

LIMITATIONS OF THE STUDY

One limitation of the study was that the participation of the sample in the educational kinesiology techniques group was on a voluntary basis. Further, for most of the subjects, English served as a second language.

Another limitation was the time constraint. The Job Training Partnership Act permits students to train for a period of 20 weeks, and then they must be job ready. By the time students reach the advanced class, they have little time left. The researcher would have preferred that each E-K techniques class continue for 6 or 8 weeks rather than the 4 weeks utilized due to the limited training time.

Chapter 2

RELATED LITERATURE

The review of literature related to this study concerns research studies on (a) vision in typewriting, (b) educational kinesiology, (c) typewriting speed and accuracy, (d) visual processes, and (e) motor skills research.

Vision in Typewriting

Two educational researchers, Fuller (1943) and Grubbs (1956), have studied the role of vision in typewriting.

Fuller Study. Fuller (1943) completed a comprehensive and detailed study of the general nature of the reading process as applied to typewriting. He used an eye-movement camera and obtained a record of each subject's eye movements as the subject typed straight-copy material. Fuller substituted the term "perception" for "reading" for typewriting. Fuller's findings indicate that the stimuli in the copy are perceived with a very small span of recognition, and the necessary stroking motions are made by the typist without conscious effort to comprehend the meaning of the printed copy.

In comparing the average number of times each subject looked at a line of writing (fixations and regressions) in typewriting and ordinary reading, Fuller found that

typewriting requires about 3.6 times as many fixations as ordinary reading. The reading rate for ordinary reading is about 5.7 times faster than the reading rate for typewriting--a sizeable decrease in reading rate and eye-span over ordinary reading. Increases in time for reading words, as in the typing process, produce a more detailed reading of copy.

Fuller's data indicate that ordinary silent reading, which takes place by word-wholes and fragmentary signals at a comparatively fast rate of speed, is not typical of the reading for typewriting. Fuller's conclusions are that word-recognition patterns are the basic reading patterns of typewriting; that is, a detailed scanning of the words so that copy may be supplied to the hand as needed. The eyes are one second ahead of the hands, and typing on the word level is confined to very short words. He concluded that (a) moving the eyes effectively and evenly along the lines of print--making a minimum of regressions--is one of the desirable habits of reading copy for typewriting; (b) reading for typewriting should be a slow, careful process, with the eyes traveling only far enough ahead to supply copy to the hand as needed; and (c) all reading errors and some mechanical errors will be eliminated by good habits of reading copy for typewriting.

Grubbs Study. Grubbs (1956) completed a study on speed of visual perception and basic skill in typewriting. The tachistoscopic speed of visual perception test was utilized to yield a measure of the innate ability of individuals to see items that were presented quickly. The Professional Ortho-Rater, a specialized stereoscope designed for use with 12 slides, was utilized to test for visual competency. Grubbs tested for the basic classifications of:

1. Phoria, or binocular alignment of the eyes. There are four tests of phoria: vertical and lateral phoria at the near-point (a simulated distance of 14 inches) and vertical and lateral phoria at the far-point (a simulated distance of 20 feet).

2. Acuity, or finesse of visual discrimination. There are six tests of acuity: both eyes, right eye, and left eye at both near and far testing distances.

3. Stereopsis, or perception of depth. There is one test and it is given at the far point (a simulated distance of 20 feet).

4. Color discrimination. There is one test of ability to discriminate among colors and it is given at the far point.

Based on data collected for 532 subjects, Grubbs concluded that (a) there is a relationship between speed of visual perception and basic skill in typewriting;

(b) improvement in perceptual speed of typists may not result in the improvement of typewriting skills; (c) typewriting performance is not completely dependent on visual fitness; i.e., some individuals with below desirable visual skills (as measured by the Ortho-Rather) demonstrated excellent scores on the speed of visual perception tests. Grubbs administered the visual fitness test to 122 subjects who had received the highest and lowest scores on the visual perception test. His final conclusion was that the performance characteristics of the visual processes needed for a skill such as typewriting are not necessarily dependent upon or related to acuity, phoria, stereopsis, or color discrimination.

Research for the current study examined the relationships that may exist between functional visual efficiency, as measured by the King-Devick Saccades Test and the Titmus Vision Tester slides, with typing for speed and accuracy. Although both the Ortho-Rater and the Titmus Vision Tester use 12 slides to measure visual efficiency, the researcher selected the Titmus Vision Tester as it is used by many industries to measure the visual skills of job applicants to insure that they meet the minimum vision standards for jobs. The Titmus is also used in schools for student screening purposes. Titmus vision slides measure acuity far and near, lateral and vertical phoria far and

near, stereopsis, and color discrimination. The Titmus Vision Tester has been approved by the Federal Aviation Administration for aeromedical use. Grubbs' conclusion that visual fitness was not necessarily a major factor in typing performance has been examined from another perspective in this study.

Educational Kinesiology (E-K)

Educational kinesiology (E-K) concepts were developed in California over a period of 15 years by Dennison (1975), a specialist in the learning acuity of children and adults. Dennison had been working extensively with dyslexics in reading clinics and was involved in a longitudinal study to see how movement intervention affected learning. His first book, Switching On (Dennison, 1981), discussed the concept of muscle testing and instructed on how to maximize a student's potential by simple movements which eliminate energy blockage in the brain hemispheres. It has also been asserted that the program has been acclaimed to reduce stress. Edu-kinesthetics is a unique merging of applied kinesiology and learning theory; it is the study of muscles and the science of testing and balancing them to restore equilibrium. Stress reduction is an important basic in Dennison's theory that emotional stress is often the primary factor in muscle imbalances and emotional well-being. Techniques for stress control are included in E-K for

improved physical and mental functioning.

Symptoms of stress as defined by Neurenberger (1981) are that the primary source of stress is a person's internal state; it is the emotional and perceptual factors that form a person's basic personality. "Emotional stress is . . . the result of a mental process: It is a state of imbalance generated as a reaction to the perception of some kind of threat, pain, or discomfort. It is also involved with the anticipation that the pain will occur in the future as a consequence of present sensory stimuli and environmental conditions" (p. 86).

Anholt (1987) examined the relationship between relaxation training and the anxiety level of vocational rehabilitation clients immediately prior to a job interview situation. The subjects were 60 adult Virginia rehabilitation clients participating in a 5-day Job-Search Skills training program. The groups were randomly assigned to one of two treatment conditions: (a) the experimental condition (received relaxation training), and (b) the control condition (received a placebo training exercise, a group discussion of job interviewing problems). On the 5th day of the program, all subjects completed the State Anxiety Scale and had their blood pressure taken immediately prior to participating as the interviewee in an audio-videotaped simulation of a job interview.

Results showed that the experimental group had lower state anxiety scores (evaluates how respondents feel "right at this moment") and trait anxiety (assesses how people "generally" feel) than the control group. Anholt concluded that relaxation training had a significant effect in helping rehabilitation clients to reduce their job interview anxiety. Thus, E-K exercises aimed at reducing anxiety could feasibly help students perform better in a stressful typewriting testing situation.

According to E-K theory, in order to read fluently, to write creatively, to spell and remember, to listen and think at the same time, we must be able to "cross the midline" which connects the right and the left brain hemispheres. In order for the right and left brain to work in an integrated fashion, the hemispheres are interconnected by the corpus callosum, an intricate bundle of nerve fibers. The right and left hemispheres operate in different modes; i.e., the left brain is critical, judgmental, and analytical; the right hemisphere receives information through the senses and looks at the world in a gestalt manner. To learn a new task, both sides of the brain need to be involved in the learning process through continual communication across this midline. Though we all cross it to some extent, this midline is still a bridge or a barrier for learning, depending upon our prior learning experiences. When the

right and left brain communicate spontaneously, working together at one time, then the midline becomes a bridge connecting neurological pathways. When the right and left brain must take turns working, then the midline becomes a barrier, and the connection is broken.

Educational kinesiology is not:

a. A panacea

b. A substitute for appropriate medical, dental, and vision care

c. A substitute for excellence in teaching and a warm and loving home environment

Although E-K has been primarily documented as successful when used with children, it is currently being adopted throughout the United States as well as in Australia and some European countries in workshops for adults. The current trend toward a holistic approach to health and the wellness programs to which industries subscribe for greater employee productivity have added to the popularity of educational kinesiology. The Educational Kinesiology Foundation in California has received course approval from the California Superintendent of Public Instruction for private post-secondary education to confer certificates of completion for its programs and courses. One educational research paper has been produced; however, unpublished case studies are available from the Institute for Edu-Kinesthetics attesting to higher performance levels in daily

activities from participants in workshops. Several colleges, such as George Washington University and the Medical College of Virginia in Richmond, are utilizing edu-kinesthetics as part of the curriculum in physical education. This study was an attempt to analyze the effect of E-K with adult students in a school learning environment.

Khalsa (1986) completed a study to determine whether educational kinesiology integration movements and/or repatterning had an effect upon the static balance of learning disabled elementary students. Khalsa defined static balance in this study "as represented by a very simple balance-coordination task maintaining the body equilibrium in some fixed position" (p. 4). Sixty elementary school students from the Chino Unified School District in California were matched on age and gender and assigned to one of three groups: (a) a control group, (b) an E-K movement group, or (c) an E-K repatterned group. The students in the E-K repatterned and E-K movement groups utilized E-K exercises for 5-minute periods, twice a day, 5 days a week for 6 weeks. The control group was not involved with E-K. Static balance in all three groups was measured using the modified stork stand test of Arnheim and Sinclair (1979) before and after the 6-week program. A Scheffe post hoc analysis indicated that the results of the groups were significantly different from one another. Khalsa concluded

that E-K movements are effective in themselves for improving balance, but that repatterning before the treatment provides an even greater level of improvement than the movements alone.

Typewriting Speed and Accuracy

The literature is replete with studies of errors in typewriting. West (1969, p. 258) found that research on typing accuracy outnumbers any other area of typing research but concluded that most studies were useless. West mentioned that in Rahe's "Typewriting Research Index" (1963, pp. 258, 316, 603), studies of error analyses, development of accuracy, and error prevention and rhythm make up about one-eighth of all the research in typewriting.

In discussing errors in typewriting, Russon and Wanous (1973) wrote that one of the major causes of errors is failure to follow the copy correctly. They also mentioned that the teacher should endeavor to keep the emotional climate of the classroom as relaxed as possible and that the typist could reduce tenseness by relaxing the shoulders, forearms, and wrists. Robinson (1972) suggested that the typist hold the eyes on the copy, control the machine parts by touch, focus attention on sentence elements, read no more than a few strokes in advance of the word being typed, and reduce the typewriting rate to permit continuous typewriting.

Salthouse's research (1986, p. 311) listed a four-component conceptualization of typing; i.e., input, parsing, translation, and execution. Salthouse concluded that typing errors can be classified into four categories originally proposed by Wells (1916): substitutions, intrusions, omissions, and transpositions. The categories are not exhaustive, but represent classifiable patterns of keystrokes that encompass a large proportion of misstrokes in typewriting.

Recent research on typewriting errors indicate that key stroking for accuracy depends on typing at a speed which controls the error rate. Students who type at speeds beyond which proper control can be initiated will tend to make excessive errors. West (1974) noted that "accuracy improvement has nothing to do with the content of the practice materials. Dozens of investigations employed nearly every conceivable type of drill material and showed them to have not the slightest positive effect" (p. 14).

For this study, educational kinesiology activities were selected to test the effectiveness of the exercises on keyboarding for speed and accuracy. Use of these exercises allowed the researcher to examine a new approach to reducing or controlling errors.

Visual Processes

Binocular vision is a complicated, precise process

which is present when everything is operating normally. There are 12 eye muscles and if they are not cooperating effectively with each other, the eyes will not be able to work well.

Jan, Freeman, and Scott (1977, p. 9) have documented that vision is divided into two types: central (macular) and peripheral. The macular area has the highest visual acuity in well-illuminated situations, whereas the peripheral is the most efficient in reduced illumination.

A person's visual acuity is a measure of how accurate his/her distance vision is. Jan, Freeman, and Scott (1977) define visual acuity as a "measure of the smallest retinal formed image that can be distinguished by the human eye" (p. 10). Visual acuity is measured by means of an eye chart called the Snellen Chart, a standardized series of letters, numbers, or symbols that must be read from a distance of 20 feet. Each line of letters is of a different size that corresponds to the standard distance at which the letters can be distinguished by a person of normal vision. Vision measured as 20/20 through 20/30 is considered normal. Lowenfeld (1973, p. 31) has stated that functional visual efficiency, the way a person uses the vision he/she has, is of more importance than visual acuity.

Many researchers have studied hemispheric dominance as it applies to the visual processes. Levy and Trevarthen

(1976), Springer and Deutsch (1985), and Springer and Gazzinga (1975) have reported that the contralateral principle applies to the right and left side of one's visual field. The design of the human nervous system is such that each cerebral hemisphere receives information primarily from the opposite half of the body. The crossover of visual information is a result of the way nerve fibers from both eyes are divided between the hemispheres. The visual areas of the left and right hemisphere normally communicate through the corpus callosum. Cross cueing refers to people's attempts to use whatever cues are available to make information accessible to both hemispheres. This concept is depicted in Figure 1.

Wertenbaker (1981, pp. 62, 63) states that the ability to recognize patterns is crucial for scanning and reading. A skilled decoder recognizes certain patterns and target letters in the text when scanning. The perceptive ability by the brain to recognize, use, and interpret visual images by relating them to previous experiences is the key to decoding.

Motor Skills Research

Skill can be defined as the ability to do something well arising from talent, training, or practice, or the ability to perform a combination of specific movements smoothly and effectively. Typewriting is a motor skill and

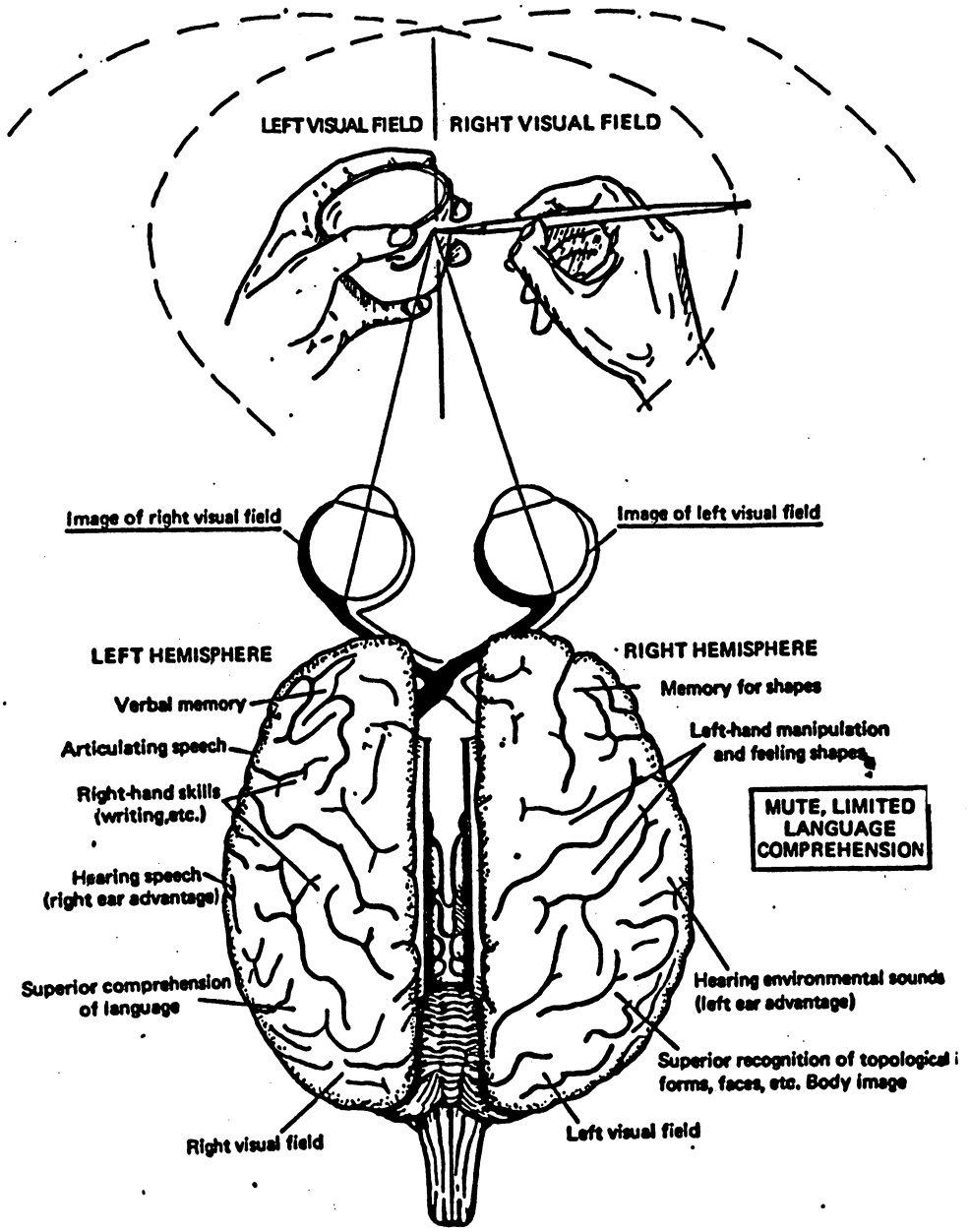

Figure 1. With the eyes fixated straight ahead, stimuli on the left of fixation point go to the right cerebral hemisphere, and stimuli on the right go to the left hemisphere. The left hemisphere controls the right hand, and the right hemisphere controls the left hand. The left hemisphere is dominant for most people; it controls written and spoken language and mathematical abilities. The minor (right) hemisphere can understand only simple language. Its main ability seems to involve spatial construction and pattern sense. (Restak, 1979)

is learned through perception of a stimulus to verbal and visual cues. One of the keys to skill development is repetition; however, the skill pattern must be repeated correctly. Jensen and Schultz's (1977, p. 67) research on athletes emphasizes that tension interferes with the effectiveness of performance. Reducing stress usually produces improved results for skill activities.

Jensen and Schultz (1977) defined kinesiology as "the study of motion" (p. 1). Further, they note:

> Proprioceptors provide the organism with information about skeletal muscle and joint awareness, which is called the kinesthetic sense . . . these receptors provide information about position, direction, and rate of movement, as well as the amount of muscle tension in a locality. We have a muscle sense as real as the external five senses. Kinesthesis is the term given to this muscle sense. (pp. 50, 51)

Restak (1979) reports that the idea of testing muscle patterns as indicators of mental states is not new. He mentions that "in the 1920s, Edumund Jacobson carried out a series of innovative experiments that correlated his subject's mental imagery with the activation of certain muscles. Jacobson discovered that if a subject imagined his right hand was moving, eye movements would shift to the

right and tiny increases in muscle tension could be recorded from the muscles of the right forearm" (p. 279).

Singer (1980) states " . . . vision . . . contribute(s) heavily to the learning and performance of most complex motor skills, especially in the early stages of practice. Later, as acts and situations become more familiar, kinesthesis plays an important role in successful performance" (p. 228).

Chapter Summary

Typewriting speed and accuracy have been the concern of researchers over many years. Studies reported by West (1969, p. 258) have delved into stroking skills, position of copy, student-directed and competency-based approaches, and accuracy versus speed for the purpose of assisting students toward a more efficient performance. Skilled typing appears to be the ability of the student to type at the right speed for maximum control. The eye-hand span adapts to the printed word to insure a continuous supply of information to the brain as needed.

Vision plays an important role in perceiving copy for typewriting. In the area of eye movements, precise coordination is demanded for success in reading copy to take place.

Educational kinesiology is a current theory introduced by Dennison (1981) that employs the study of movement for

self-directed learning innate within individuals to take place. E-K offers activities asserted to promote increased visual processing, motor flexibility, whole body coordination, and to reduce stress. E-K utilizes bilateral rhythmic, balanced movements that require relating the right side of the body to the left.

This study examined outcomes of manipulated activities (E-K techniques) having to do with the areas of vision and stress and their relationship to typewriting speed and accuracy development.

Chapter 3

PROCEDURES AND METHODOLOGY

The procedural aspects of this study concern (a) quasi-experimental design, (b) population/sample, (c) test measurements, (d) test administration, (e) edu-kinesiology training, and (f) data analysis.

Quasi-experimental Design

The quasi-experimental design used in this study is the Nonequivalent Control-Group Design, which is represented as:

Experimental	Pretest	E-K Training	Posttest
Control	Pretest		Posttest

The distinguishing features of the nonequivalent control-group design are: administration of a pretest and posttest to both treatment groups, and nonrandom assignment of subjects to the groups (Borg & Gall, 1983, p. 682). In this particular research project, it was not possible to randomly assign students to the experimental and control groups.

The independent variables for this study are: (a) measurement of visual efficiency and (b) E-K treatment or no treatment.

The dependent variables are the speed and accuracy performance scores in typewriting. This chapter explains the data gathering methods and the data analysis procedures employed to test the null hypotheses:

HO_1 The change in typewriting speed between the pretest and posttest does not differ for two groups of students, those who receive educational kinesiology training and those who do not receive the training.

HO_2 The change in typewriting speed between the pretest and posttest does not differ for two groups of students, those functionally visually efficient and those functionally visually inefficient.

HO_3 No interaction exists between typewriting pretest-posttest speed scores for students who do and do not receive educational kinesiology training and for students with and without functional visual efficiency.

HO_4 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of students, those who receive educational

kinesiology training and those who do not receive the training.

HO_5 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of students, those functionally visually efficient and those functionally visually inefficient.

HO_6 No interaction exists between typewriting pretest-posttest error scores for students who do and do not receive educational kinesiology training and for students with and without functional visual efficiency.

Subjects

The results of this study can be generalized to the extent that the subjects are from the same population of students that the Employment Training Program normally receives its students. The Employment Training Program is an open-entry/open-exit program operating from September through June and serves disadvantaged students who are in need of skills training and who are actively seeking employment.

The students of JTPA range in age from 18 to 65. Most are on welfare or other subsidies and many have part-time employment positions. Clients are predominantly female and

are the primary wage earners of the household. Table 1 provides information about the general characteristics of JTPA clients.

The eligibility of students is based solely on the guidelines issued by the Department of Labor. Determining applicants who are "economically disadvantaged" depends on family size and income. In 1987, the living standard income level for a family of one was $5,430, and as the family size increased, so did the income level. Applicants are required to complete an eligibility checklist with (a) proof of address using identification of voter's registration card, etc.; (b) proof of household income, such as paycheck stubs from the previous six months; (c) social security card or driver's license; (d) U.S. citizens must have proof of citizenship; and (e) immigrants or refugees must have proof of alien status, such as a green card.

The JTPA contract for instructors in the Arlington School System is from September through June. During that period, three separate groups of students completed E-K training. Upon completion of the training, data from the subjects, 31 experimental and 44 control, were assembled. The subjects were 4 males and 71 females ranging in age from 17 to 60 with a mean age of 30 years. Table 2 has been completed for the characteristics of students who participated in the JTPA Program from 1987-1988 and were included in the E-K study.

TABLE 1

Distribution of Title IIA Enrollees in Each Initial Program Assignment by Selected Characteristics: Participants Newly Enrolled in JTPA During PY 1985 (July 1985-June 1986) and PY 1984 (July 1984-June1985)

	Initial Program Assignment and Time Periods											
	Total		CT		OJT		JSA		WE		Other Services	
Selected Characteristics	PY 85	PY 84	PY 85	PY 84	PY 85	PY 84	PY 85	PY 84	PY 85	PY 84	PY 85	PY 84
Total Enrollees	752,900	708,000	282,400	270,000	168,000	158,700	164,400	149,700	56,500	57,100	81,600	72,500
Sex												
Male	47	48	39	38	56	59	53	53	49	50	47	48
Female	53	52	61	62	44	41	47	47	51	50	53	52
Minority Status												
White (excluding Hispanic)	55	55	49	50	65	67	52	51	53	56	57	57
Black (excluding Hispanic)	32	31	36	35	22	20	34	35	33	30	33	33
Hispanic	10	10	11	11	10	10	11	11	9	8	7	6
Other	3	4	3	4	3	3	4	3	5	6	2	4
Age at Enrollment												
Younger than 19	22	20	19	16	9	9	16	15	54	57	45	38
19-21	20	20	22	21	21	21	19	19	19	20	17	19
22-29	28	29	29	32	36	37	29	29	14	12	18	19
30-44	23	23	25	25	27	26	26	25	9	9	12	17
45-54	4	4	4	4	5	4	5	6	3	2	4	4
55 and older	3	3	2	2	3	2	4	5	1	1	4	3
Economically Disadvantaged	92	93	92	94	91	93	91	92	94	94	91	95
Unemployment Compensation Claimant at Application	7	9	7	9	9	10	8	12	3	2	6	7
Participant Did Not Work During the 26 Weeks Prior to Application	52	54	57	57	41	42	53	55	61	67	53	58
Handicapped	10	9	10	8	7	7	9	9	17	15	17	13
Veteran at Application	9	9	7	7	13	14	12	11	3	3	7	8
Receiving Public Assistance at Application												
AFDC	21	21	28	28	12	14	18	18	22	23	20	21
Cash public assistance (AFDC, General, Refugee, SSI)	28	28	35	35	17	18	26	25	30	29	26	27
Food stamps	31	31	36	35	25	27	30	27	33	35	28	31
Any public assistance (cash and/or noncash)	40	42	47	48	31	33	38	38	46	47	39	42
Adult welfare[1]	16	17	21	23	12	13	17	16	8	7	9	10
Other adult assistance	10	10	9	10	12	12	10	10	6	6	6	9
Youth (age <22)	15	15	16	15	6	8	11	11	33	34	24	23
Education Status												
School dropout	27	27	29	29	25	26	28	26	19	21	26	23
Student (HS or less)	14	13	10	8	4	3	9	10	50	51	36	32
High school graduate or equivalent (no post HS)	42	43	44	46	51	50	43	44	21	20	29	33
Post high school	17	17	17	17	21	20	19	21	10	8	9	12

[1]Receiving AFDC, General Assistance and/or Refugee Assistance and at least 22 years of age at enrollment.

Table 2

Selected Characteristics of JTPA Population Utilized in Study

Selected Characteristics	JTPA/1987-88
Total Enrollees	75
Sex	
Male	4
Female	71
Minority Status	
White (excluding Hispanic)	4
Black (excluding Hispanic)	13
Hispanic	24
Asian	29
Other	5
Age at Enrollment	
Younger than 19	0
19-21	12
22-29	24
30-44	26
45-54	3
55 and older	1
Receiving public funds	
AFDC/public assistance/Refugee Asst. or Food stamps	11
Poverty level	52
Youth (under 22)	12
Underemployed	19
Unemployed	56
Education Status	
School droput	14
HS graduate or GED	36
Post high school	25
Head of Household	
Yes	27
No	48
Number in family	
Single	23
2-4	49
5-8	3

Subjects were advised of the general nature of the study and the time involved. They were invited to volunteer for the educational kinesiology training. Those who elected to participate signed consent forms. A copy of the form is included in Appendix A. Ethical constraints required that subjects be instructed that participation in the study was not mandatory and that they would not be penalized in any way should they choose not to participate. Clients were assured that they could withdraw from the study at any time without penalty. All of the subjects who volunteered for the training continued through the 4 weeks.

Instrumentation

Typewriting Pretest

Two straight-copy, 5-minute timed writing pretests were administered to subjects in the typewriting class. The subjects chose the better of the two timings after computing words per minute and proofreading for errors. This procedure is used by businesses in the Washington area for testing job applicants. A data sheet was prepared for subjects to complete at the time of the tests. A final proofreading and check on computations was made by the researcher. A sample test and data sheet may be found in Appendix B.

The pretests and posttests were selected from the test booklet prepared by Mulkerne and Andrews (1983).

Titmus Visual Screening Tester

Selected for use in this study was the Titmus Vision Tester--a precision-built stereoscopic instrument designed for rapid and precise measurement of visual performance. The operation of the instrument requires a minimum of instruction and training time. The test results accurately show how the eyes perform but do not show the etiology for failing any of the vision tests.

Validity. The validity basis for the Titmus Vision Tester involved the studies of the Massachusetts Vision Tests in modified Ortho-Raters performed by the Bausch & Lomb Optical Company in 1956-57 (Gentile & Johnson, 1961). The Bausch & Lomb Optical Company became interested in stereoscopic vision testing in 1939 and began a research project at Purdue University with statistical operations under the direction of Drs. Tiffin and Wirt. Consulting committees from ophthalmic groups were involved and their combined efforts well documented. At the end of 3 years of work, Wirt (1943) and Kephart and McCormick (1948) recorded that a stereoscope designed specifically for the job of vision testing could produce valid, reliable, and usable results. The basis for the development of the Ortho-Rater was the foundation of the development of the Titmus Vision Tester. The Tester's main function was the selection, placement, and periodic retesting of personnel within commercial and industrial plants.

The Massachusetts Department of Public Health under the direction of Sloane (1940), developed the Massachusetts Vision Tests for school children. The Titmus Vision Tester duplicated the findings of the Massachusetts unit in 1958 for use in school testing. Blackhurst and Radke (1966) have reported standards for the battery of vision screening tests as determined by the Michigan Department of Public Health working closely with an advisory committee of ophthalmologists of the Michigan State Medical Society.

Standards of Referral in the Michigan School Vision Screening Program may be found in Table 3.

The Titmus Vision Tester was approved for use in schools by the Michigan State Department of Health. In a brochure published by the Eye Health Service, New York, Gruber (not dated), suggests several instruments that have been developed to test visual functions for industry. Reported in the brochure are findings that compare the normal standard visual acuity profile that is required for a particular job. The Titmus Vision Tester is among those mentioned as acceptably measuring the standards prescribed. A sample copy of the general record form for the Titmus Vision Tester may be found in Appendix C.

Procedures for Testing. The battery of 10 tests from the Titmus Vision Tester were administered to subjects to determine functional visual efficiency. They were:

Table 3

Standards of Referral in the Michigan School Vision Screening Program

Grades 1 to 12

Test 1--Visual Acuity

Inability to read correctly 4 out of 6 20/30 Snellen E symbols with either eye.

Test 2--Plus Lens

Ability to read correctly at least 4 out of 6 20/20 Snellen E symbols with either eye while using a 1.75 diopter plus sphere lens.

Test 3--Phoria

Far-Point (20 feet):

Esophoria	6[a]	prism diopters[b]
Exophoria	4[a]	prism diopters

Near-Point (14 in., Reading distance):

Esophoria	6[c]	prism diopters
Exophoria	8[c]	prism diopters

[a]Phoria far point--normal on the scale is 5.

[b]Prism diopters are units of angular measurement related to the position of the eyes.

[c]Phoria near point--normal on the scale is 7. Only the Near-Point test was utilized in this study.

(a) and (b) acuity far tests administered for each eye; (c) and (d) acuity near tests administered for each eye; (e) and (f) binocular testing far and near; (g) lateral phoria far test; (h) vertical phoria far test; (i) color perception; and (j) lateral and vertical phoria near test. In administering the tests, subjects are seated at a table or desk. Directions for examining the slides are explained prior to beginning testing. The angle of the Tester is adjustable so that the subject can perceive the slides with ease. Far and near slides are switched with just a turn of the knob and subjects call out letters or numbers as directed by the tester. Data are compiled on the individual scoring sheet by the teacher as the tests are given.

With only three exceptions, the acuity tests for the subjects of this study fell within the prescribed limits of 20/20 through 20/30 of visual acceptability. The lateral and vertical phoria far tests and color perception test results for the subjects were also within normal ranges. Usable Titmus test results were limited to the lateral and vertical phoria near test that measures muscle balance, the relationship of the image of each eye to that of its fellow. R. P. Rinearson (personal communication, July 10, 1989) explained the muscle balance test as follows:

> This is a reference point for eye alignment. The subjects view a red ball with the right eye and a

table with the left eye. If the eyes are straight (orthophoria), the ball appears to be upon the table to the viewer, then the score is "pass." If the ball appears to the viewer so that it is not touching the table, indicating that the eyes have a strong tendency to turn out (exophoria), or to turn in (esophoria), the score is "fail." This is a measure of the imbalance of alignment of the eye muscles.

The number of subjects passing the Titmus lateral and vertical phoria near test in this study were 45 (60%), and 30 subjects (40%) failed.

The K-D Saccade Test--Eye Tracking Test

The New York State Optometric Test (K-D Saccade Test) was administered to the subjects to measure the extent that their eyes could cross the midline (center of their bodies) effectively and quickly. A saccade test is defined as the quick movement of the eyes to localize objects accurately (eye tracking skills). The test is used to examine ability in reading across the page.

The K-D is a three-part norm referenced test for assessment of eye movements. The subject sits at a table and is asked to "call out" a series of single-digit numbers on each subtest, KD-1, KD-2, and KD-3, as rapidly as possible. These numbers are placed on the sheet of paper so

as to simulate saccades in a reading situation. Scores are evaluated in terms of time in seconds to complete each part of the test. There is a correction factor allowed for omissions or additions. There is an individual score for each part as well as a total score. Functional visual inefficiency is the inability to meet norms for errors and time. A sample of this test is provided in Appendix D.

Validity. King and Devick (Lieberman, Cohen, & Rubin, 1983) developed this test at the Illinois College of Optometry in 1976 under a research study entitled, "The Proposed King and Devick Saccade Test and Its Relationship to the Pierce Saccade Tests and Reading Levels." The data that King and Devick compiled in their study were based upon a sample of 137 subjects from a middle class school district in the Chicago suburbs. Table 4 depicts the results of the study.

Lieberman, Cohen, and Rubin (1983) evaluated several tests for New York public schools purported to evaluate visual tracking, which can be administered and scored by individuals who do not have specialized training in evaluating ocular movements. They selected the K-D test and, in 1979 a prepilot study was conducted at a public school in Queens, New York, using it. Data were collected on 1202 students from grades 1-6. The authors concluded that through inspection of the data obtained in the New York

TABLE 4

Original results of King-Devick study, Chicago, 1976

	AVERAGE TIME (BY AGE), N=137				
	AGE	I	II	III	TOTAL
Time	6	34.40	39.47	42.07	115.93
Deviation	6	6.60	10.04	11.54	23.28
Time	7	30.18	33.82	39.71	103.71
Deviation	7	4.72	6.19	7.09	14.46
Time	8	24.40	27.92	32.60	84.00
Deviation	8	5.28	7.07	6.93	17.23
Time	9	23.52	23.57	29.43	76.78
Deviation	9	7.86	6.35	8.68	20.74
Time	10	21.26	22.79	25.00	69.00
Deviation	10	4.78	5.09	7.48	15.57
Time	11	20.09	19.87	24.39	64.04
Deviation	11	4.50	3.45	5.67	12.87
Time	12	20.07	21.00	21.73	62.80
Deviation	12	2.99	4.24	3.77	9.82

study that the test outcomes were remarkably consistent (p. 634). Table 5 illustrates the results obtained in the study for chronological age and errors.

Lieberman, Cohen, and Rubin (1983) noted that the NYSOA K-D Saccadic Test investigates some of the oculomotor skills involved in reading.

> The timed test mimics the stress like demand of time and goal-oriented reading . . . . The test is standardized and . . . provides non-optometrists with the opportunity to score oculomotor performance which is similar to the visual tracking used in reading . . . This test is ideal as a screening device since a performance is no longer a function of age, and that above age 9, a simple pass/fail notation should be used rather than an age equivalent. Above age 9--the number of errors, when graphed, flattens out and above this point age equivalents should not be used for errors. (p. 637)

The number of subjects passing the K-D test in this study were 57 (76%), and 18 (24%) subjects failed the tracking test.

Educational Kinesiology

Applied kinesiology is the study of muscles and the science of testing and balancing them to restore

TABLE 5

Mean and Standard Deviation of Number of Seconds to Perform Each Part of the NYSOA K-D Test and the Total Number of Seconds Versus Age

		TIME IN SECONDS			
Age		I	II	III	Total
6	# of students	100	100	100	100
	Average	30.88	37.08	51.00	118.03
	S.D.	10.10	12.88	18.38	40.82
7	# of students	127	127	127	127
	Average	26.71	31.12	43.06	100.88
	S.D.	8.87	8.76	16.36	28.16
8	# of students	223	223	223	223
	Average	22.88	24.88	31.26	78.13
	S.D.	8.37	7.76	11.68	27.36
9	# of students	207	207	207	207
	Average	21.02	22.88	29.83	73.44
	S.D.	7.20	7.60	10.82	26.03
10	# of students	117	117	117	117
	Average	19.72	20.78	27.78	68.27
	S.D.	6.08	7.37	10.21	26.22
11	# of students	121	121	121	121
	Average	17.68	18.88	26.38	60.82
	S.D.	4.66	4.61	7.48	13.86
12	# of students	102	102	102	102
	Average	16.84	17.68	19.42	54.04
	S.D.	3.66	4.43	6.31	13.61
13	# of students	100	100	100	100
	Average	16.28	16.86	18.88	52.23
	S.D.	2.62	2.72	3.26	7.60
14	# of students	106	106	106	106
	Average	14.66	16.87	18.73	50.46
	S.D.	2.46	2.33	2.48	6.84

NYSOA KD TEST (sample size 1202)

equilibrium. Educational kinesiology uses information from "muscle testing" and applies it to the mind. Edu-kinesthetics means education through movement (Dennison, 1981). The exercises have been designed by Dennison to promote integration of the right and left hemispheres for more effective use of the eyes, ears, and body.

E-K Training. At the conclusion of the typewriting pretest, the concept of educational kinesiology was explained to the subjects, and they were informed of the possibility of reducing typewriting errors and stress by taking E-K training. Some of the subjects refused to participate; therefore, volunteers were requested. Two subjects who refused the training after the orientation were placed in the control group. The control group was not permitted to type during the morning or afternoon E-K training sessions. Those subjects were given English vocabulary building and dictionary practice sheets to complete. The total number of subjects participating in the E-K training group was 31, and 44 subjects remained in the control group.

Subjects who volunteered to work with E-K techniques for 10 minutes twice a day were placed in the Dennison Laterality Repatterning Group. Subjects were given a 90-minute orientation and shown how to do the movements on an individual basis. The E-K repatterning techniques took approximately 10 minutes per person during the orientation

and are described in detail in Appendix E.

The repatterned E-K group then entered into a 4-week program utilizing the E-K movements described in Appendix F. The E-K movement program was conducted for 10 minutes each morning prior to typewriting class and for 10 minutes immediately after lunch prior to the typewriting "lab" by the classroom teacher. Handouts were supplied and the teacher requested that the movements be practiced before retiring at night for not more than 10 minutes.

Typewriting Posttest

The same procedure was followed for the typewriting posttest as for the pretest. Two straight-copy, 5-minute timed writing tests were administered for all subjects in the control and experimental groups. The test selection was administered from the booklet prepared by Mulkerne and Andrews (1983). The subjects prepared a data sheet and chose the better of the two timed writings, as is the practice in businesses in the Washington area. The researcher completed a final proofreading and computational check.

DATA ANALYSIS

The data were analyzed using two-way analysis of variance. Summary statistics were also presented with means, standard errors, and minimum and maximum speed and

error scores for both the pretest and the posttest. The two-way classification for the analyses of variance completed were educational kinesiology group versus the control group and functionally visually efficient group versus the functionally visually inefficient group. The outcomes of two vision tests--the Titmus vision test and the King-Devick Saccade Test--determined student placement into each of the two vision function groups. The dependent variables for the analyses of variances (ANOVAS) were speed and error difference scores from the pretest to the posttest. The Number Cruncher Statistical System (NCSS) was used for the ANOVAS. ANOVAS were interpreted as significant if differences existed among the scores for the two groups of subjects at the .05 level. The following chart provides an illustration of the data analysis design that was used.

Data Analysis Design

	Functionally Visually Efficient	Functionally Visually Inefficient
E-K Group	Pretest/posttest speed/error difference score	Pretest/posttest speed/error difference score
Control Group	Pretest/posttest speed/error difference score	Pretest/posttest speed/error difference score

Chapter Summary

A quasi-experimental research design was used to gather data from experimental and control groups to test the effects of educational kinesiology and functional visual efficiency on keyboarding speed and accuracy.

Five-minute timed writings were administered as pretests to 75 subjects in the Employment Training Program in Arlington. Subjects' vision was tested using the Titmus stereoscopic vision tester to measure muscle balance and the King-Devick saccade test to determine eye tracking skills. Subjects were classified as functionally visually efficient by passing both vision tests.

Subjects who volunteered for educational kinesiology techniques for bilateral integration and stress reduction were placed in the Dennison Laterality Repatterning group. The movement program was conducted by the teacher for 10 minutes each morning for 4 weeks prior to typewriting class and for 10 minutes after lunch prior to typewriting "lab." Typewriting posttests were administered to subjects in both the experimental and control groups.

Data were analyzed using two-way analyses of variance. The Number Cruncher Statistical System (NCSS) was used for the ANOVAS. The data analysis design used the two-way classification of educational kinesiology group versus the control group and the functionally visually efficient group

versus the functionally visually inefficient group.

Chapters 4 and 5 report the findings and the summary, conclusions, and recommendations respectively.

Chapter 4

FINDINGS

This study was undertaken to determine if educational kinesiology techniques training has an effect on typewriting speed and accuracy. Another aspect of this study was to determine the effect of functional visual efficiency on typewriting speed and accuracy. The following findings will be discussed: (a) correlation between two vision tests, (b) summary of functional visual efficiency, (c) summary of typewriting speed and accuracy improvement, and (d) analyses completed to test the research hypotheses.

A two-way analysis of variance was performed to determine whether educational kinesiology training and/or functional visual efficiency has an effect on typewriting speed improvement. A second two-way analysis of variance was performed to determine whether educational kinesiology training and/or functional visual efficiency has an effect on typewriting accuracy improvement. The interaction effect between educational kinesiology training and functional visual efficiency on typewriting speed and accuracy was also examined.

Vision Test Correlations

Correlations were calculated to determine the strength,

if any, of the relationship existing between the two vision tests--the Titmus lateral and vertical phoria at the near point (simulated for 14 inches) and the speed and accuracy scores for the King-Devick Saccade test. A correlation coefficient of .1147 indicated a weak, positive relationship between the Titmus and the King-Devick tests. The two tests measure different aspects of the visual processes for typewriting. The Titmus test examines the static binocular aspects of the eyes as they focus on an object; the King-Devick test looks at the kinetic muscle control of the eyes as they travel across the page. Both tests were needed to determine functional visual efficiency as it relates to the typewriting processes. Outcomes of tests for acuity, color vision, and distance phoria were within normal ranges for the subjects and were not used in the analyses. To be classified as functionally visually efficient, subjects had to pass both vision tests according to the standards provided for the tests. Classification as having passed or failed the Titmus lateral and vertical phoria near test and the K-D saccade test for the 75 subjects is provided in Table 6. The number of subjects passing both visual tests and, therefore, considered as functionally visually efficient was 36; there were 39 subjects who did not pass both tests and were considered functionally visually inefficient.

Table 6

Summary of Functional Visual Efficiency

Lateral and Vertical Phoria Near	Pass	45	(60%)
	Fail	30	(40%)
King-Devick Saccade Test	Pass	57	(76%)
	Fail	18	(24%)
Functional Visual Efficiency	Pass	36	(48%)
	Fail	39	(52%)

Speed Improvement

Speed improvement was determined by the differences between the pretest and the posttest typewriting scores for speed. A strong, positive relationship between the prespeed and postspeed scores is indicated by a correlation coefficient of .8361. The data indicate that subjects with high prespeed typewriting scores were likely to have high postspeed typewriting scores; likewise, subjects with low prespeed typewriting scores were likely to have low postspeed typewriting scores.

To test the three null hypotheses concerning speed improvement, a two-way analysis of variance was performed. Table 7 contains the descriptive statistics for typewriting speed improvement scores.

Table 8 contains results of the two-way ANOVA computed for speed improvement scores. Hypotheses tested and findings were as follows:

HO_1 The change in typewriting speed between the pretest and posttest does not differ for two groups of subjects, those who receive educational kinesiology training and those who do not receive the training.

Findings: The analysis of variance yielded a F value with a probability of .98 indicating that educational kinesiology training had no effect on typewriting speed improvement.

Table 7

Descriptive Statistics for Speed Improvement Scores for Visually Efficient and Visually Inefficient Subjects

Group	N	Mean[a]	SD	SE	Min	Max
Visually Efficient						
E-K Training	14	4.14	6.29	1.68	-6	12
No E-K Training	22	4.18	6.47	1.38	-5	20
Total	36					
Visually Inefficient						
E-K Training	17	3.65	6.27	1.52	- 8	15
No E-K Training	22	3.55	6.47	1.38	-15	21
Total	39					

[a]Speed improvement was determined by subtracting pretest gross words per minute scores from posttest gross words per minute scores.

Table 8

Results of Two-Way Analysis of Variance: Speed Improvement

Source	SS	df	MS	F	P
Treatment	0.018	1	0.018	0.00	.98
Visual Efficiency	5.796	1	5.796	0.15	.70
Treatment x Vis.Ef.	0.089	1	0.089	0.00	.96
Error	2794.32	71	39.357		
Total	2800.67	74			

HO_2 The change in typewriting speed between the pretest and posttest does not differ for two groups of students, those functionally visually efficient and those functionally visually inefficient.

Findings: The analysis of variance yielded a F value with a probability of .70 indicating that functional visual efficiency had no effect on typewriting speed improvement. The data were not significantly different at the .05 level.

HO_3 No interaction exists between typewriting pretest-posttest speed scores for students who do and do not receive educational kinesiology training and for students with and without functional visual efficiency.

Findings: The analysis of variance yielded a F value with a probability of .96 indicating that no interaction exists.

Accuracy Improvement

Accuracy improvement was determined by the difference between the pretest and posttest typewriting error scores. The preerror and posterror scores show a moderate, positive relationship of .5668 correlation coefficient indicating that the subjects with many typewriting errors on the pretest were likely to have more errors on the posttest; likewise, subjects with few errors on the typewriting

pretest were likely to have fewer errors on the posttest. Table 9 contains the descriptive statistics for the typewriting error improvement scores.

Table 10 contains results of the two-way ANOVA computed for accuracy improvement scores. Hypotheses tested and findings were as follows:

HO_4 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of subjects, those who receive educational kinesiology training and those who do not receive the training.

Findings: The analysis of variance yielded a F value with a probability of .98 indicating that educational kinesiology training had no effect on accuracy improvement for typewriting.

HO_5 The change in typewriting accuracy between the pretest and posttest does not differ for two groups of students, those functionally visually efficient and those functionally visually inefficient.

Findings: The analysis of variance yielded a F value with a probability of .51 indicating that functional visual efficiency had no effect on accuracy improvement for typewriting.

HO_6 No interaction exists between typewriting pretest-posttest accuracy scores for subjects who do and

Table 9

Descriptive Statistics for Accuracy Improvement Scores for Visually Efficient and Visually Inefficient Subjects

Group	N	Mean[a]	SD	SE	Min	Max
Visually Efficient						
E-K Training	14	2.07	6.96	1.86	-15	15
No E-K Training	22	3.45	6.94	1.48	- 6	20
Total	36					
Visually Inefficient						
E-K Training	17	2.41	6.97	1.69	-11	19
No E-K Training	22	0.95	6.94	1.48	-16	12
Total	39					

[a]Accuracy improvement was determined by subtracting number of errors on the 5-minute pretest from number of errors on the 5-minute posttest.

Table 10

Descriptive Statistics for Pretest-Posttest Error Scores for Visually Efficient and Visually Inefficient Subjects

Source	SS	df	MS	F	P
Treatment	0.02	1	0.02	0.00	.98
Visual Efficiency	21.09	1	21.09	0.44	.51
Treatment x Vis.Eff.	36.48	1	36.48	0.75	.39
Error	3431.46	71	48.33		
Total	3501.15	74			

do not receive educational kinesiology training and for students with and without functional visual efficiency.

Findings: The analysis of variance yielded a F value with a probability of .39 indicating that no interaction effects exist at the .05 level.

Summary of the Findings

The major findings of this study regarding typewriting speed and accuracy improvement for subjects who were given training in educational kinesiology and those who were not given the training and for students with and without functional visual efficiency may be summarized as follows:

1. Educational kinesiology training had no effect on typewriting speed improvement. The mean of the E-K group 5-minute pretest for speed was 38.26 words per minute as compared with a mean for the control group subjects of 37.03 words per minute. The mean of the E-K group 5-minute posttest for speed was 42.13 words per minute as compared with a mean for the control group subjects of 40.89 words per minute. Improvement for the E-K group was 3.87 words per minute as compared with 3.86 words per minute for the control group. Both groups improved their speed at approximately the same rate during the 4-week period. The difference was not significant at the .05 level.

2. Educational kinesiology training had no effect on typewriting accuracy improvement. The mean of the E-K group 5-minute pretest for accuracy was 11.81 as compared with a mean for the control group subjects of 11.15 words per minute. The mean of the E-K group 5-minute posttest was 9.55 as compared with a mean for the control group subjects of 8.95 errors. Improvement for the E-K group was a mean of 2.26 errors as compared with a mean for the control group subjects of 2.20 errors. The E-K group improved in accuracy a fraction better than their counterparts. The difference was not significant at the .05 level.

3. Functional visual efficiency had no effect on typewriting speed improvement. The pretest mean score for subjects who were visually efficient was 38.53 compared with 36.62 for the visually inefficient subjects. The posttest mean score for subjects who were visually efficient was 42.69 compared with a mean of 40.21 for visually inefficient subjects. The functionally visually efficient group improvement scores were 4.17 words per minute over a 5-minute time period. The functionally visually inefficient group improvement scores were 3.59 words per minute over a 5-minute time period. The difference in improvement was not statistically significant.

4. Functional visual efficiency had no effect on typewriting accuracy improvement. The 5-minute typewriting

pretest error mean score for the functionally visually efficient subjects was 10.81 as compared with a mean score of 12.00 for the visually inefficient subjects. The posttest mean score for the functionally visually efficient subjects was 7.89 as compared with the posterror mean score of 10.41 for the visually inefficient subjects. Accuracy improvement for the functionally visually efficient subjects was a mean score of 2.92 as compared with the mean score of 1.59 for the functionally visually inefficient subjects. There was a difference of approximately 1 1/3 errors in accuracy improvement between the groups; however, the difference was not statistically significant.

5. There was no interaction effect for either speed or accuracy for subjects who had completed educational kinesiology training and for those who had not had the training nor for subjects with functional visual efficiency and those subjects visually inefficient. It is interesting to note that visually inefficient subjects who did not take educational kinesiology training made only minor improvements with respect to accuracy with a mean error difference of 0.95. Their visually inefficient counterparts who did take the educational kinesiology training had somewhat greater improvement with respect to typewriting accuracy with a mean of 2.14. The most improved group was the no E-K visually efficient group with a mean of 3.45.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The problem of this study was to determine if training in the concepts and techniques of educational kinesiology has a positive effect on typewriting speed and accuracy. A second aspect of the study was to determine the effect of functional visual efficiency on typewriting speed and accuracy.

Summary

This study examined the possibility that educational kinesiology techniques that have been developed by Dennison (1981) and have been acclaimed to improve hand-eye coordination, vision, and to reduce stress will assist students, both with and without functional visual efficiency, to improve keyboarding skills. Dennison's theory (1981, p. 31) is that emotional stress is often the primary factor in muscle imbalances and emotional well-being. A number of activities are used in his program to reduce stress, improve an individuals' self-concept, and promote growth.

Dennison & Hargrove (1985, p. 49), coined three terms to clarify the complex functioning and structure of the brain--laterality, centering, and back/front. Educational

kinesiology deals with these three brain dimensions. Specific exercises, movements, and techniques that Dennison (1981) postulates relate to the different dimensions of the brain are applied for whole-brain integration to take place. The E-K exercises are safe, simple, natural movements that have been asserted to promote better hemispheric integration for the eyes, ears, and body.

A quasi-experimental research design was used to gather data from the experimental and control groups. Seventy-five students with the Employment Training Program in Arlington, Virginia, participated in the study to determine whether typewriting speed could be increased and errors reduced during a 4-week period in which some of the participants were taught educational kinesiology procedures. Volunteers worked with educational kinesiology techniques 10 minutes prior to typewriting activity in the morning and 10 minutes immediately after lunch prior to typewriting "lab" to determine if stress reduction techniques and bilateral movement could enhance typewriting speed and accuracy. The number of subjects participating in the E-K training group was 31, and 44 subjects remained in the control group.

Five-minute timed writing pretests and posttests were administered to the subjects to evaluate the effects of the treatment. All subjects were tested for functional visual efficiency using the Titmus Vision Tester and the King-

Devick Saccade Test. The Titmus Vision Tester is a stereoscopic instrument designed for rapid and precise measurement of visual performance. In this study, only the lateral and vertical phoria near test that measures muscle balance was used (the relationship of each eye to that of its fellow). The King-Devick Saccade Test was administered to determine the extent the eyes could cross the midline (center of the body). The K-D test examines the ability to read effectively across the page.

Two two-way analysis of variance procedures were performed to test the hypotheses.

For hypotheses 1 and 4, a significant difference did not exist in typewriting speed and accuracy for subjects with and without educational kinesiology training. The E-K techniques practiced for 4 weeks did not influence timed-writing results at the .05 level of significance.

For hypotheses 2 and 5, a significant difference did not exist in typewriting speed and accuracy for subjects with and without functional visual efficiency.

For hypotheses 3 and 6, there was no significant interaction effect between subjects with or without educational kinesiology training and those subjects with or without functional visual efficiency.

Conclusions

The following conclusions are based upon the findings of this study.

1. For the subjects of this study, educational kinesiology training had no effect on typewriting speed or accuracy improvement. According to Dennison (1981) and Dennison and Hargrove (1985), the theory and practice of educational kinesiology can balance the cerebral hemispheres for better integration and can reduce stress for improved information processing. The findings of this study, however, indicate that the use of E-K training for improvement of typewriting speed and accuracy is questionable and would not be of benefit to typewriting students if limited to the 4 week duration of this study.

2. Functional visual efficiency had no effect on typewriting speed and accuracy improvement for subjects of this study. Grubbs (1956) concluded from his study that typewriting performance is not completely dependent on visual fitness; i.e., some individuals with below desirable visual skills demonstrated excellent scores on the speed of visual perception tests, as measured by the Ortho-Rater. Grubbs' final conclusion was that the performance characteristics of the visual processes needed for typewriting are not necessarily dependent upon or related to acuity, phoria, stereopsis, or color discrimination. The

Titmus Vision Tester was used to test the same variables used in the Grubbs' study. The K-D Saccade Test was used to test the visual processes needed for tracking across the written copy. Subjects were considered functionally visually efficient by passing both vision tests. The results of the testing for visual processes in this study confirm Grubbs' conclusions that visual fitness is not necessarily a major factor in typewriting performance.

3. No interaction existed between typewriting pretest and posttest speed or accuracy scores for students who did or did not receive educational kinesiology training and for students with or without functional visual efficiency. Thus, no basis exists for assuming that educational kinesiology techniques would be more likely to benefit students with visual deficiencies as measured in this study than students who are visually efficient.

Discussion

Subjects in the Employment Training Program are individuals of many nationalities and often from minority groups. In many cases, English is a second language, and the ability to assimilate a new culture, language, and work habits in a very short time has proven stressful and discouraging. Further, some of the subjects of this study did not bring a strong educational foundation from their own

countries. If the basics of grammar and syntax are not learned in one's own educational system, it becomes extremely difficult to master another language. On the other hand, U.S. citizens who enter the program are usually dropouts from a previous academic system and not highly motivated toward additional study. All have one thing in common: they must find employment to take care of themselves and their families.

Employers in the Washington Metropolitan Area need a supply of trained clerical personnel; therefore, mastering keyboarding and English skills can be the answer to finding employment. Keyboarding is a complex skill and requires good coordination of hand-eye, concentration, focus, and letter discrimination. Skill building in all areas demands patience and repetition and can be stressful.

Dennison (1981) recommends educational kinesiology techniques of simple body movements to integrate the functions of the brain, balance the system for more energy, and reduce stress. E-K also uses cross-motor patterning to cross the body's midline for reading and writing which forces both sides of the brain to work cooperatively. The researcher initiated the study to test the theory against the practical problems of keyboarding for speed and accuracy and to determine if E-K might benefit the visual processes for improved keyboarding.

Stress is a built-in factor for many of the Employment Training subjects. E-K theory states that stress influences our learning ability, health, relationships and attitudes, and permeates all our living experiences. It is possible that the 4-week time constraint of this study was not sufficient time to overcome habits ingrained for most of the subjects' adult lives. The researcher would have preferred to work with the techniques of E-K for 6 or 8 weeks; however, time limitations were imposed.

The subjects who volunteered for educational kinesiology training mentioned that they enjoyed doing the exercises and movements associated with the techniques and had experienced a more positive and relaxed attitude toward taking 5-minute typewriting tests.

Recommendations

The following recommendations are suggested:

1. A similar study should be completed at the secondary level. Adult subjects participating in JTPA programs have many problems; i.e., personal problems and fear of failure in the academic system that may not be prevalent among secondary students. Further, secondary students are involved in classroom activities for a longer period of time. If E-K techniques were practiced for 3 months rather than 4 weeks, results might have been more positive.

2. An interrelationship between the basics of language with the skills of typewriting should be examined. In the area of typewriting, language structure, language use, word recognition, and speech patterns may be one of the stumbling blocks for foreign born as well as handicapped Americans in building accuracy and speed in typewriting.

3. Since there are presumed relationships between vision, language skills, and eye-hand coordination in typewriting, continued research is needed in this area.

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APPENDIX A

INFORMED CONSENT

INFORMED CONSENT

I understand that I will be participating in a research study, which is intended to examine the relationship of vision and specific energy-direction exercises for typing accuracy and speed building. The time duration is four weeks.

I understand that I will be required to participate in group dynamics each morning and each afternoon for ten minutes with the Instructor prior to taking timed writings and "lab" practice.

I understand that all of the procedures and tasks involved in this study are safe and will not have any effect on my physical or mental well-being.

I am aware that the potential benefit for me would be toward increased efficiency in keyboarding, whether it is on the typewriter or the computer. The exercises will offer release from stress, increase energy, improve posture, and improve communication skills. I also understand that others who receive such training may also similarly benefit from their participation. If such is found to be the case, it will mean that the Employment Training Program will have been improved and that my participation will have helped to make this possible.

I understand that my participating is voluntary and that I may refuse to participate or discontinue participation at any time without any penalty or loss of benefits to which I am otherwise entitled.

I understand that any information from testing will be held in the strictest confidence by the investigator and will be destroyed when the results of the data have been examined.

My signature below indicates that I have read the information contained in this document and that all of the foregoing information has been explained to me, and that I fully understand and agree to participate in the study.

Student's
Signature:----------

Date:----------

APPENDIX B

TYPEWRITING TEST AND DATA SHEET

Name _____ Date _____

PLAIN COPY TYPING--TIME: 5 MINUTES

You will have two chances to take the following test. Set the left margin at 10 and the right margin at 80. Double space and type the lines exactly as you see them, indenting each paragraph.

	WORD COUNT	
	First Typing	Second Typing
How important is pefsonality to your job success? It is	12	285
estimated that 80 to 90 percent of those people who are fired	25	297
from their jobs lose them because of personality characteris-	37	310
tics rather than inability to do the work.	46	318
Office work is done in association with other people, and	58	331
people who have learned to get along with other people easily,	71	344
happily, congenially, and without friction will have a much	83	356
better chance of both getting and holding jobs than those	95	367
who have not.	98	370
The longer I live and the more I see of people and their	110	383
ways, the more I am thoroughly convinced that the possession	122	395
of the right sort of personality traits is at least as impor-	134	407
tant as skills. It is not easy to present a composite picture	147	420
of the traits needed by office workers. Most employers would	159	432
agree that the ability to follow instructions and take orders	172	444
is of prime importance.	177	449
Another trait that is treasured by employers is the will-	189	462
ingness to be on the job every day and to put in a full day's	202	474
work. Honesty is also an important quality. Dishonest employ-	214	487
ees who fail to keep company matters confidential or who help	227	499
themselves to company property cause the company to lose money	239	512
unnecessarily.	242	515
There is no substitute for career know-how. But among	254	527
people who are capable workers, those who can work harmo-	266	539
niously with others come out ahead.	273	546

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Proofread your paper, circle your errors, and count them. Determine your total words for your last complete line and for part of a line. Divide the total by 5. Record the gross words per minute and total number of errors on the top of each timing. On the data sheet provided, record the timed writing scores and errors for the five-minute timings taken.

DATA SHEET FOR TIMED WRITINGS

Five-minute timed writings

NAME_____ DATE_____

AGE_____

MALE_____ FEMALE_____

Test #1

GROSS WORDS_____

GROSS WORDS PER MINUTE_____ ERRORS_____

Test #2

GROSS WORDS_____

GROSS WORDS PER MINUTE_____ ERRORS_____

SUMMARY

AVERAGE GROSS WORDS PER MINUTE_____ ERRORS_____

APPENDIX C

RECORD FORM FOR TITMUS TESTER

GENERAL RECORD FORM for TITMUS VISION TESTER

NAME _____ DATE _____

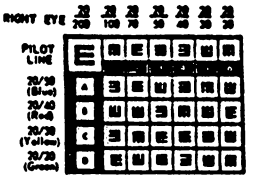
ADDRESS _____

_____

WEARING GLASSES ☐ YES ☐ NO

CONTACT LENSES ☐ YES ☐ NO

AGE _____



GROUP 1

ELEMENTARY GRADE TESTS				
ACUITY – FAR POINT • LENS LEVER AT "FAR"		4 OUT OF 6 = PASS	TEST RESULT	
DIAL AT #1	RIGHT EYE	LEFT EYE SWITCH "OFF"	20/	
DIAL AT #1	LEFT EYE	RIGHT EYE SWITCH "OFF"	20/	
TEST FOR EXCESSIVE FARSIGHTEDNESS • PLUS LENS • FAR POINT (Insert Plus Lens Unit)			PASS	FAIL
DIAL AT #1	LEFT EYE	RIGHT EYE SWITCH "OFF"		
DIAL AT #1	RIGHT EYE	LEFT EYE SWITCH "OFF"		
(WITHDRAW PLUS LENS UNIT) A READING OF 20/30 OR 20/20 LINE THROUGH PLUS LENS = FAIL				
MUSCLE BALANCE TEST – FAR POINT • LENS LEVER AT "FAR"			PASS	FAIL
(1) DIAL AT #2	LEFT EYE SWITCH "OFF"	(PICNIC SCENE EXPLAINED)		
(2) DIAL AT #2	RIGHT & LEFT SWITCH "ON"	(RED APPLE LANDS ON TABLE = PASS)		
MUSCLE BALANCE TEST – NEAR POINT • LENS LEVER AT "NEAR"			PASS	FAIL
DIAL AT #4	BOTH SWITCHES REMAIN AT "ON"	(RED APPLE STILL ON TABLE = PASS)		

GROUP 2

PRE-SCHOOL TEST

20/20, 20/30, 20/40, 20/50, 20/70, 20/100

(Circle Acuity Level at which You are Testing) Must Read All Pictures Correctly

LENS LEVER AT "FAR" TO WHICH PICTURE DO TABLE LEGS POINT?

RIGHT EYE TEST Left Switch at "OFF"		PASS	FAIL	LEFT EYE TEST Right Switch at "OFF"		PASS	FAIL
DIAL AT #5	BIRD			DIAL AT #8	BIRD		
DIAL AT #6	RABBIT			DIAL AT #7	BOY		
DIAL AT #7	BOY			DIAL AT #6	GIRL		
DIAL AT #8	GIRL			DIAL AT #5	RABBIT		
OR DIAL AT #8	BINOCULARITY SLIDE			BOTH SWITCHES "ON"			

GROUP 3

SECONDARY SCHOOL AND ADULT TEST

DIAL AT #9 ACUITY "FAR" RIGHT EYE 20/ LEFT EYE 20/ BOTH EYES 20/

DIAL AT #3 OR DIAL AT #3 COLOR PERCEPTION "FAR" A12 B5 C26 D6 E16 F NOTHING PASS FAIL

1 2 3 4 5 6 7 8

DIAL AT #10 LATERAL PHORIA "FAR" 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

DIAL AT #11 VERTICAL PHORIA "FAR" 1 2 3 4 5 6 7

DIAL AT #12 ACUITY "NEAR" RIGHT EYE 20/ LEFT EYE 20/ BOTH EYES 20/

DIAL AT #9 VISUAL ACUITY TESTS AT "FAR"

	LEFT EYE	BOTH EYES	RIGHT EYE	
1	ZN	RO	HK	20/200
2	R K S	H N C	Z O D	20/100
3	H C D V	S K Z O	R N D S	20/70
4	Z R O D	N S C H	V Z K N	20/50
5	K H S C	O Z N R	D N V C	20/40
6	O N R Z V	D K H C S	K D S O N	20/30
7	S D C H N	V R Z K O	H S N R D	20/20

DIAL AT #12 VISUAL ACUITY TESTS AT NEAR

	LEFT EYE	BOTH EYES	RIGHT EYE	
1	S V C	N R K	H Z O	20/100
2	R N Z H	D O K V	C S Z N	20/70
3	C K V D	S N Z R	D O H C	20/50
4	V H R N	O D S K	N Z C S	20/40
5	H S K R C	N Z D O V	Z S H N K	20/30
6	Z O N V R	H C S K D	V K C D S	20/20

WRITE COMMENTS ON BACK OF RECORD FORM

_____ Test Administrator

TITMUS OPTICAL ., INC.
PETERSBURG, VA. U.S.A.

CAT. NO. 0V7-6R

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APPENDIX D

KING-DEVICK SACCADE TEST

NYSOA K-D TESTS

Sample Score Sheet

I	II	III
2 - 5 - 8 - 0 - 7	3 - 7 - 5 - 9 - 0	5 - 4 - 1 - 8 - 0
3 - 7 - 9 - 4 - 6	2 - 5 - 7 - 4 - 6	4 - 6 - 3 - 5 - 9
5 - 3 - 1 - 6 - 4	1 - 4 - 7 - 6 - 3	7 - 5 - 4 - 2 - 7
7 - 9 - 7 - 3 - 5	7 - 9 - 3 - 9 - 0	3 - 2 - 6 - 9 - 4
1 - 5 - 4 - 9 - 2	4 - 5 - 2 - 1 - 7	1 - 4 - 5 - 1 - 3
6 - 5 - 5 - 7 - 3	5 - 3 - 7 - 4 - 8	9 - 3 - 4 - 8 - 5
3 - 1 - 8 - 6 - 4	7 - 4 - 6 - 5 - 2	5 - 1 - 6 - 3 - 1
5 - 3 - 7 - 5 - 2	9 - 0 - 2 - 3 - 6	4 - 3 - 5 - 2 - 7

		Average Time (by age)				Average Errors (by age)			
	Age	I	II	III	Total	I	II	III	Total
Time	6	30.98	37.05	51.00	119.03	1.32	3.81	10.84	16.97
Deviation	6	10.10	12.96	19.39	40.92				
Time	7	26.71	31.12	43.06	100.89	1.12	2.10	8.75	11.97
Deviation	7	5.97	8.75	15.36	25.16				
Time	8	22.98	24.89	31.26	79.13	.34	.53	2.48	3.35
Deviation	8	6.37	7.75	11.59	27.35				
Time	9	21.02	22.89	29.53	73.44	.28	.45	2.02	2.75
Deviation	9	7.20	7.50	10.82	26.03				
Time	10	19.72	20.79	27.76	68.27	.28	.43	1.12	1.83
Deviation	10	6.08	7.37	10.21	26.22				
Time	11	17.58	18.95	20.39	56.92	.25	.33	.62	1.20
Deviation	11	4.60	4.51	7.45	13.85				
Time	12	16.94	17.68	19.42	54.04	.18	.21	.44	.83
Deviation	12	3.60	4.43	5.31	13.51				
Time	13	16.29	16.96	18.98	52.23	.12	.12	.36	.59
Deviation	13	2.52	2.72	3.26	7.50				
Time	14	14.86	16.87	18.73	50.46	.07	.07	.33	.47
Deviation	14	2.40	2.33	2.49	5.84				

TIME	I	II	III	Total	ERRORS	I	II	III	Total

Note For Screening Purposes:Failure results when norm plus (+) one standard deviation is exceeded.

APPENDIX E

DENNISON LATERALITY REPATTERNING

DENNISON LATERALITY REPATTERNING

1. TESTING

   A. Test a strong indicator muscle in the clear.

   B. Have the student cross-crawl, touching hand to opposite knee for 10-20 repetitions. (Each side once is a full repetition.)

   C. Test the indicator muscle. Note: Is it strong or weak? If it is weak, the student may be homolateral (primarily using one hemisphere). Confirm the finding with the remaining tests.

   D. Have the student homolateral crawl, touching hand to the same knee, for 10-20 repetitions. Test the indicator muscle. Note: Is it strong or weak? If it is strong, the student is homolateral and needs repatterning.

   F. Have student look at X. If X weakens the indicator muscle, the student is homolateral.

   G. Have student look at two parallel vertical lines, II. If this strengthens the indicator muscle, the student is homolateral.

<u>To begin repatterning</u>:

1. Muscle test the student to see if he/she is ready for further integration.

2. Have the student cross-crawl with eyes purposefully turned to access the reflex brain. (Usually up to the left, as reflex is on the right side of the brain for most people.)

3. Retest the indicator muscle, noting that it is now strong on cross-crawl; not weak. If it is still weak, have subject cross-crawl with eyes up to the right. Repeat the muscle test. It should now be strong.

4. Have the subject homolateral crawl with eyes turned to access the analytic brain. (Down to the right, as the analytic brain is on the left side.)

5. Retest the indicator muscle, noting that it is now weak on this activity; not strong. If it is not weak, do more repetitions or continue with eyes down to the left, instead of right.

II. Integration

1. Have subject clasp his/her two hands together to symbolically integrate the two brain hemispheres "feeling the left and right brains working together."

2. Have the student cross-crawl with eyes looking in all directions.

3. Retest the indicator muscle. It should be strong, no matter where the subject points his/her eyes.

4. Have the subject homolateral crawl with eyes looking in all directions.

5. Retest looking at X. The indicator muscle should now be strong.

6. Retest looking at II. The indicator muscle should now be weak.

7. Discuss the changes the subject is experiencing. This has been a moment of rebirth for thousands of people.

Dennison Laterality Repatterning (Dennison & Hargrove, 1985) is not suggested as a panacea for all ills. As a part of any sound educational or health maintenance program, it is providing results for people who have failed to find help elsewhere. The patterning gives people permission to cross the midline, restoring the natural process of the subject to trust, to let go of conscious control, and to access the right-brain for movement.

APPENDIX F

E-K MOVEMENTS

E-K MOVEMENTS

The body is an electrical system which needs an adequate supply of water to operate without stress. E-K methods suggest asking subjects to drink one glass of water before muscle testing to determine if the testor is getting a correct muscle reading.

1. Brain button

   The subject will massage vigorously the Kidney 27 areas (the soft spots under the clavicle) for thirty seconds, while holding the navel.

2. Cook's Hookup

   A. Phase 1

   Sitting in a comfortable chair, cross left leg over right knee. Hold left ankle with the right hand. Hold the "ball" of left foot with left hand. Relax and breathe deeply with tongue against roof of mouth on inhale and place tongue behind bottom teeth on exhale. HOLD POSTURE FOR AT LEAST ONE MINUTE.

   B. Phase 2

   Sitting with both feet on the floor, touch the fingers of one hand against the fingers of the other. Continue to breathe deeply, as before. HOLD FOR AT LEAST ONE MINUTE.

3. Positive Points

   The positive points are neuro-vascular holding points on the frontal eminences found half-way between the eyebrows and the hairline. When lightly held, by oneself or another, these points are helpful to repattern conditioned responses to emotionally charged thoughts about people, places, memories, tasks, and environmental factors.

4. Cross Crawl

Touching hand to opposite knee (as in marching movement), for 10-20 repetitions. (Each side once is a full repetition.)

5. Thinking Cap (Concentration)

Unfold the ears from top to bottom, three times each.

6. Neck Rolls (to cross midline)

Roll the neck gently three times in each direction, breathing slowly and letting go of any tension experienced in your body. A visualization that the neck is separate and unattached to the body is often helpful.

7. Figure 8's (for eyes)

Drawn first with each hand separately, then with both hands together, integrates both hemispheres simultaneously. (May be done on the chalkboard or in the air.)

8. The Elephant

Draw a Lazy 8 with each arm held against the ear. The whole body moves with it, except the arm, shoulders, and ear.

9. The Butterfly (for focus)

Imagine a butterfly on the ceiling and trace its wings with the nose. Grasp the neck at the sides or the back while tracing the wings.

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