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Use of Eye Movement as an Indicator of Sensory Components in Thought

Michael Orval Buckner
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Michael Orval Buckner entitled "Use of Eye Movement as an Indicator of Sensory Components in Thought." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Naomi M. Meara, Major Professor

We have read this dissertation and recommend its acceptance:

Gary Klukken, Kenneth Newton, Charles Thompson

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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USE OF EYE MOVEMENT AS AN INDICATOR OF SENSORY COMPONENTS IN THOUGHT

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Michael Orval Buckner

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DEDICATION

This dissertation is dedicated to three women whose support and wisdom have been essential throughout my graduate studies: to my wife, Kay, who has taught me about love through her example of committment; to my mentor, Naomi, who taught me how to think and how to write like a scientist; and to my friend, Karen, who taught me how to feel like a therapist.

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ABSTRACT

The purpose of this study was to investigate some of the basic tenets of the Neuro-Linguistic Programming (NLP) eye movement model which state that specific eye movements are indicative of when a person is thinking visually, auditorily, and/or kinesthetically. Forty-eight graduate and undergraduate students from educational psychology classes were interviewed and were asked to concentrate on a single thought while their eye movements were videotaped. They were subsequently asked if their thoughts contained visual, auditory, and/or kinesthetic components. Two NLP trained observers independently rated edited silent videotapes of the subjects and reported the presence of eye movements posited by NLP theorists to indicate visual, auditory, and/or kinesthetic components in thought. Interrater agreement was caluclated using Cohen's (kappa), K =.82, which supports the NLP claim that eye movement patterns do exist and that trained observers will agree on the identification of such patterns. Coefficients of agreement were calculated using Cohen's K (kappa) to evaluate agreement between participants' self-reports of sensory components in thought and trained observers' reports of corresponding eye movements hypothesized by NLP theorists. Results indicate support for the visual, K =.81, p<.001, and auditory, K =.65, p<.001, portions of the NLP eye movement model. The kinesthetic, K =-.15, p<.85, portion of the NLP eye movement model was not supported. The discussion focuses (a) upon limitations of the study such as the use of right-handed participants only and the use of observers trained in NLP theory, (b) upon implications of the study for NLP theory and for counselors in the

field, and (c) upon recommendations for future research including alternate methods for examining the kinesthetic portion of the eye movement model and a suggestion for examining the NLP construct of Primary Representational System .

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CHAPTER I

INTRODUCTION

Statement of Problem

Previous research studies into the Neuro-Linguistic Programming (NLP) eye movement model have attempted to investigate the model utilizing the theoretical construct of Primary Representational Systems (PRS). However, the utilization of PRS to investigate the eye movement model is based upon a misunderstanding of NLP theory. Therefore the present study examined the basic tenets of the eye movement model, which state that specific eye movements are indicative of when a person is thinking visually, auditorily, and/or kinesthetically, independent of the construct of PRS.

Literature Review

During the last twelve years Neuro-Linguistic Programming (NLP) has gained popularity among practitioners (Harmon & O'Neill, 1981). NLP's popularity has developed in spite of little research evidence supporting its usefulness as an effective counseling tool (Sharpley, 1984). Two areas of particular interest in research involving NLP have been the NLP eye movement model and the NLP claim for a Primary (or Preferred) Representational System (PRS).

NLP theorists propose that all persons take in information about the world and about themselves through sensory modalities: visual, auditory, kinesthetic, gustatory, and olfactory. For each sensory modality, NLP theorists posit two systems: (a) a Lead System (LS) through which a thought or memory is accessible and (b) a Representational System (RS) through which a

person's internalized map of reality is "re-presented" or experienced (Dilts, Grinder, Bandler, Bandler, & Delozier, 1980). Bandler and Grinder (1975) claim that most people will subconsciously represent their internalized map of reality through a favored RS and that this RS will be indicated linguistically by a predominance of sensory based predicates reflecting the PRS. For example, according to Bandler and Grinder (1975), a person with an auditory PRS would use phrases such as "sounds good" or "loud and clear" more often than visual phrases such as "I see what you mean" and "looks good" or kinesthetic phrases such as "feels right" and "I feel that...".

According to Grinder and Bandler (1976) and Dilts (1983), eye movements can be an indicator of which sensory modality is being accessed (LS) or employed (RS) at a given moment. Dilts (1983) describes eye movements as indicators of activity in sensory specific areas of the brain. Segalowitz (1983) suggests that such eye movements may be induced by electrical activity from one area of the brain overflowing to another area which excites particular eye movements. For example, lateral eye movements to either side or down and to an individual's left are posited to indicate internal auditory activity. Eye movements down and to the right are said to indicate accessing of bodily or emotional awareness. Upward eye movements or staring fixedly into space are said to indicate internal visual activity. Dilts (1983) says this model is applicable to most right-handed people, and that the down left and down right designations are merely reversed for most left-handed people. NLP theorists do not say, however, that eye movements should be used to determine an individual's PRS (Bandler, 1978). R. B. Dilts (personal communication, August 20, 1983) states that the PRS cannot be

determined by counting eye movements and by determining which type occurs most often. This is because eye movements can indicate activity within either an LS or an RS, and the two are not distinguishable simply by counting eye movements (Dilts, 1983). Thus, while a given modality may be indicated by eye movements, accurately determining PRS usually requires some linguistic information such as sensory based predicates.

Dilts et al. (1980) describe an LS as the sensory modality in which a thought or memory was originally stored. The LS may differ from the RS in which the thought or memory is represented linguistically. For example, if someone is asked a question and responds with an immediate upward eye movement and with the words, "I feel good when I think about that," the NLP description of the process is that the person responded to the question by accessing the memory visually through an LS and by representing the memory kinesthetically through an RS (Bandler, 1978). Dilts (1983) predicts that in this example the upward eye movement (indicating visual accessing within the LS) would probably be followed by an eye movement down and to the right indicating RS activity in the kinesthetic modality.

A number of previous studies (Owens, 1977; Gumm, Walker, & Day, 1982; Beale, 1980; Thomason, Arbuckle, & Cady, 1980; Hernandez, 1981; Falzett, 1981; Ellickson, 1981; Dorn, Atwater, Jereb, & Russell, 1983; and Graunke & Roberts, 1985) employed eye movements to determine PRS. There appear to be two fundamental problems with such an approach. First, these studies used the untested NLP eye movement model to find PRS, and as noted above NLP theory states that PRS cannot be determined by eye movements. Second, PRS is a construct within NLP theory (Einspruch and

Forman, 1985) while eye movements are posited to be visible, external physiological responses to internal cognitive processing. The more logical direction for research is to ascertain first if eye movements are indicative of sensory specific cognitive processing and if so then to explore the construct of PRS utilizing findings about eye movements.

To date the only research published which has examined the NLP eye movement model independent of PRS is that of Dilts (1983). Dilts (1983) used an EEG to record electro-ocular activity and cortical activity and attempted to correlate specific eye movements with activity within specific cortical areas. Dilts (1983) does not actually report his full results and explains that his study yielded incomplete results. The findings and difficulties he does report were considered in designing the methodology of this study. Dilts (1983) found that the eye electrodes were less satisfactory than videotape equipment for plotting eye movements. Dilts also found that eye movements did not correlate directly with brain wave patterns from EEG readings. He did observe a strong relationship between eye movement patterns and sensory specific cognitive tasks. Self reports of participants after the study were the most helpful data for determining whether visual, auditory, or kinesthetic modalities were being employed. Dilts (1983) suggests that future studies exploring the NLP eye movement model should be structured to employ videotaping to evaluate eye movements and verbal self reports of participants to get information about which sensory modality is being employed at a given moment. Beck and Beck (1984) suggest that a "proper test" of the eye movement model should include a stimulus question with observation of eye movements followed by a process question in which the participant would describe his/her internal experience in

terms of the sensory components of the experience. This study reflects the approaches suggested by Dilts (1983) and by Beck and Beck (1984).

Rationale

If the NLP eye movement model is to be of value to the counselor in the field, it must be observable and verifiable within an interview situation. Such verifiability requires examining the NLP eye movement model independent of the PRS within an interview situation. Thus this study was designed to examine the eye movement model independent of the concept of a PRS. Of specific interest in this study are the NLP tenets (a) that visual components in thought can be identified by upward eye movements and by fixed staring into space, (b) that auditory components in thought can be identified by observing lateral eye movements and eye movements down and to the participant's left, and (c) that kinesthetic components in thought can be identified by eye movments down and to the participant's right. The designations of down and to the participant's left or right are specified by NLP theorists as being applicable to most right-handed persons. Dilts et al (1980) suggest that a large portion of left-handed people may have the down left and down right designations reversed. Because Dilts et al (1980) imply that left-handed people are less likely to fit a single model, and because this study is exploratory in nature, participants were limited to those self reporting as right-handed.

Einspruch and Forman (1985) claim that researchers evaluating the NLP eye movement model must perform individual calibrations for each participant being tested because NLP proponents recognize that the pattern of eye movements may at times vary across individuals. The NLP method for such

calibration (Dilts et al, 1980) is to interview participants by asking questions. These questions are so designed that respondents must specifically employ (a) visual, (b) auditory, or (c) kinesthetic thoughts in order to provide answers. The eye movements are then observed as the questions are answered, and the eye movement patterns are calibrated to the sensory specific task required to answer the question. This method of calibration, however, has an inherent logical problem and presents some procedural difficulties. Using this method for individual calibrations, already assumes that such eye movement patterns exist. The procedural difficulties are described in detail in the Procedures section below. Although assumption of the model may seem logical for practitioners of NLP, researchers must be more skeptical and not take for granted that there are regular patterns. The approach of this study is not to assume that patterns exist but to explore the possibility of the presence of a single pattern across many participants.

If the NLP assumption is correct, that specific eye movements will occur when a person's thought contains one or more of the sensory components , then (a) upward eye movements or staring into space responses will be exhibited immediately before or during thoughts which are self reported to have visual components, (b) lateral eye movements or eye movements down and to the participant's left will be exhibited immediately before or during thoughts which are self reported to have auditory components, and (c) eye movements down and to the participant's right will be exhibited immediately before or during thoughts which are self reported to have kinesthetic components. Thus when a right-handed person who has exhibited one or more of the eye movements described above is asked to describe the thought

in terms of its sensory components, the description will contain sensory components which correspond to the specific eye movement or eye movements observed by an observer trained in the NLP model. Specifically, if the NLP assumptions about eye movements and sensory components in thought are correct, the agreement between the ratings of trained observers and the self reports of participants would exceed the agreement expected by chance.

Hypotheses

All the hypotheses are stated in the null form and relate to the coefficient of agreement between the self-report of the participants and the ratings of the trained observers. Specifically, the relationship between the participant's self-reports of thoughts and the trained observers' ratings of NLP posited eye movements was explored.

Hypothesis 1: Agreement between participants' self-reports, that the thoughts described contain visual components, and trained observers' ratings, that corresponding participants' eye movements are those posited by NLP theorists as visual, is not different from the agreement expected by chance.

Hypothesis 2: Agreement between participants' self-reports, that the thoughts described contain auditory components, and trained observers' ratings, that corresponding participants' eye movements are those posited by NLP theorists as auditory, is not different from the agreement expected by chance.

Hypothesis 3: Agreement between participants' self-reports, that the thoughts described contain kinesthetic components, and trained observers' ratings, that corresponding participants' eye movements are those posited by

NLP theorists as kinesthetic, is not different from the agreement expected by chance.

CHAPTER II

METHOD

Participants

Participants for the study (N=48) were right-handed graduate and undergraduate students from educational psychology classes at the University of Tennessee at Knoxville. Volunteers were sought from these classes and no students were offered bonus grade points for their participation in the study. The number of participants was computed by power analysis (Cohen, 1977) using Cohen's (1965) recommendation that the significance level be established at alpha=.05, that power be .80, and that effect size be medium. The choice of a medium effect size (Cohen, 1977) was also validated by a review of data from a pilot study as described below.

Procedures

Pilot Studies. The results of two pilot studies (Buckner, 1984; Buckner & Meara, 1985) revealed procedural difficulties which could confound results. Steps were taken to avoid these difficulties. For example, in the first study an interviewer gave tasks designed to be sensory specific to participants who were rated by a trained observer recording the participants' eye movements through a two-way mirror. Examples of tasks used were: (a) "Which is the brightest room in your home?" for a visual task, (b) "Listen to one of your favorite songs in your own head." for an auditory task, and (c) "Which of your feet is warmer right now?" for a kinesthetic task.

The approach of asking participants to respond to the tasks revealed inconsistent results because an unknown number of thoughts may occur before a participant actually finishes a given task. Some participants given a visual task reported that before thinking about the task itself, they would repeat the question internally through auditory subvocalization. A participant given the auditory task of listening to one of his favorite songs reported visualizing the sheet music before and while he heard the song in his head. Several participants responding to kinesthetic tasks reported internal imagery about the task prior to completing the task itelf. To avoid the confounding of rating eye movements which might correspond to unknown thoughts, the current study was designed so that participants would be asked to concentrate on a single thought as is indicated below in the description of the interview.

In procedural checks for the first pilot study it was observed that most participants who were simply asked to describe their thoughts in sensory terms interpreted the word "sensory" to mean sensual or bodily feelings. When these same participants were asked if they were aware of visual or auditory components, all answered that a visual component, an auditory component, or both visual and auditory components accompanied the kinesthetic components of the thought or memory. This finding suggested that often more than one sensory modality was employed for a given thought, but that, unless asked about other modalities, participants tended to describe only one modality. Thus, the decision was made to ask each participant about all three modalities.

To avoid the suggestion of any particular sensory modality, it was decided to (a) videotape eye movements as participants concentrated on a

pleasant thought of their own choosing, (b) ask participants afterward about the presence of each of the sensory components in their thoughts, and (c) compare the agreement of eye movement and self reports of sensory based components.

The methodology for gathering participant data in the second pilot study (Buckner & Meara, 1985) was identical to the methodology proposed for the current study. A trained observer evaluated participant eye movements from the videotape used in the second pilot study in the same manner as proposed for the current study. Agreement between the ratings of the trained observer report and the participant self reports indicated that a medium effect size would be appropriate in the computation of power analysis (Cohen, 1977).

Pre-Interview Instructions. Before the interview participants were given Participant Information Sheets which described what would happen in the interview and which provided examples of what was expected from them. Participants were informed that they woul be asked about the content of a single pleasant thought and that they would be informed of their right to keep the content of the thought private. The Participant Information Sheet also gave a brief example of (a) a visual component in thinking such as seeing an image of a place they have been, (b) an auditory component in thinking such as hearing the sound of a friend's voice, and (c) a kinesthetic component in thinking such as feeling again the temperature of a warm day or reexperiencing an emotional feeling. Six forms of the sheet were available containing all the possible orders of descriptions of the visual, auditory, and kinesthetic components in thought. These six forms were distributed evenly among the participants to avoid an order effect. The distribution was

predetermined by a random draw with replacement of the six possible combinations. The Participant Information Sheet is found in Appendix A.

Interview. Participants were asked to enter a small interview room one at a time and to be seated directly in front of and about three feet from an interviewer. participants were seated at a slight angle and about eight feet from a video camera which was focused on each participants's face. The interviewer began by briefly reviewing the instructions for the interview. Each participant was then asked to think in silence about a single pleasant thought or memory. As each participant concentrated, the interviewer timed the activity by watching a wall mounted timer and after ten seconds asked each participant to describe the content of the thought or memory. Next the interviewer asked the participant three questions, (a) "Are you aware, in your thought of seeing anything?", (b) "Are you aware, in your thought of hearing anything?", and (c) "Are you aware, in your thought of feeling anything like a touch or an emotion?" The order of these questions was randomized in advance by a draw with replacement so that an order effect would be avoided. The participants all answered in the affirmative or negative for each of the three questions.

Interviewer. The interviewer was trained by the experimenter to employ only a prepared set of requests and questions. The interviewer had no knowledge of the design of or expectation for the study.

Camera Operator. The camera operator was instructed to fill the video monitor with each participant's face and to keep the camera sharply focused

on the participant's face. The camera operator had no knowledge of the design of or the expectation for the study.

Trained Observers. The study employed two trained observers who have been certified as trainers by the Society of Neuro-Linguistic Programming. Each trained observer individually viewed silent videotaped segments of the participants. Each segment was edited to begin immediately after the interviewer's instructions for the participant to begin thinking and was edited to end as the participant spoke his/her first word in response to the interviewer's request to describe the thought. The trained observers were instructed by the experimenter to record the presence of (a) upward eye movements or staring into space responses, (b) lateral eye movements or eye movements down and to the participant's left, and/or (c) eye movements down and to the participant's right for each participant tape segment.

Since the trained observers are certified as NLP trainers, there is a possibility that they could have made some reasonably accurate inferences about the purpose and design of the research study. The possibility that the trained observers' ratings were biased due to such inferences is, however, limited because the portions of the videotape which the trained observers rated was silent. Thus, the trained observers had no direct knowledge of the content or sequence of interviewer's questions or of participants' responses.

Results were recorded on a rating sheet which had a column for each of the three types of eye movements and a row for each participant tape segment. Upward eye movements were defined as any which were above a plane level with the participant's own eyes. Staring into space reponses are demonstrated when the participant looks fixedly in one direction with eyes

opened widely. Lateral eye movements are defined as any to the participant's left or right which are on a plane level with the participant's eyes. Eye movments down and to the subect's left are defined as any which are below the plane level with the participant's eyes and in direction of the participant's left-hand side. Eye movements down and to the subect's right are defined as any which are below the plane level with the participant's eyes and in direction of the participant's right-hand side.

Prior to the study the trained observers were tested by the experimenter. This test involved having each trained observer watch and rate the eye movements of ten pilot study participants from a pre-rated silent videotape. Each trained observer exceeded 90% agreement with the pre-established ratings for the silent videotape. Additionally, an interrater agreement level of 90% was established prior to the study as necessary to consider the ratings as reliable. A coefficient of interrater agreement was calculated for the two trained observers using Cohen's ***K*** (Cohen, 1960) as recommended by Tinsely and Wiess. (1975) Agreement between the two trained observers was thus expected to be at least ***K***=.80, which reflects an actual agreement of 90% adjusted by possible agreement due to chance.

Materials

Materials included (a) an interviewer script (Appendix B), (b) a 10 X 10 foot interview room containing one chair each for the participant, interviewer, and camera operator(Appendix C), (c) a wall mounted timer which indicated seconds (Appendix C), (d) video equipment including a video camera with tripod, video cassette recorder, a television monitor, and a microphone (Appendix C), (e) six forms of the participant Information Sheet described

above (Appendix A), (f) participant release forms for each participant (Appendix D), and (g) a sheet of "Some Possible Thoughts/Memories" if needed (Appendix E).

Measures

Participant Self Reports. Participant self reports were compiled by reviewing the videotaped interviews. Eight answers were possible in response to the three questions asked by the interviewer. Participants could report a thought which was (a) only seeing, (b) seeing and hearing, (c) seeing and feeling, (d) seeing, hearing, and feeling, (e) only hearing, (f) hearing and feeling, (g) only feeling, and (h) no awareness of seeing, hearing, or feeling. In order to evaluate the three hypotheses, participant self reports were compared with trained observer reports for frequency of agreement which was then converted into a percentage of agreement between trained observer reports and participant reports for each sensory modality.

Videotape Preparation and Rating. The portion of videotape used for rating was edited from a videotape of the complete interviews for all of the participants. Two videotape recorders were used in this editing process. To assure that the edited tape was silent, no audio cable was used between the recorders. For each participant interview, a segment of the interview was copied from the original tape to the edited version. Each segment began with the interviewer's statement, "Please begin to concentrate now," and ended with the interviewer's request, "Now if you are willing, I would like you to describe your thought." For accuracy in rating, a voice was dubbed on the

edited tape which separated the participants by giving a number (1-48) for each successive participant on the tape.

The trained observers were supplied with sheets of paper designed for recording their observations. The record sheets had rows numbered 1-48 and had three columns labeled (a) visual, (b) auditory, and (c) kinesthetic. The trained observers worked independently, and each was instructed to make a single check in the appropriate column and row if he/she observed any eye movements posited as being (a) visual, (b) auditory, or (c) kinesthetic. No checks were made when corresponding eye movements were not observed.

Design and Data Analysis

Variables. The first variable, participant self report, was the reported presence or the absence of the visual, auditory, and/or kinesthetic components in thought. The self report for each participant consisted of "yes" or "no" responses to the questions asked by the interviewer, (a) "In your thought, are you aware of seeing anything?", (b) "In your thought, are you aware of hearing anything?", and (c) "In your thought are you aware of feeling anything such as a touch or an emotion?"

The second variable was the rating of the trained observer. Each trained observer made a checkmark on the rating form in the appropriate column for each type of eye movement detected for every participant. The absence of any type of eye movement was not recorded. Raw data are found in Appendix F.

Trained Observer/Participant Agreement. A frequency of agreements between trained observers and participants was determined. One instance of trained observer/participant agreement was counted each time a trained observer identified a type of eye movement posited by NLP theorists to correspond to a sensory modality reported by a participant.

Since interrater agreement exceeded the predetermined value of K=.80, the frequency of trained observer/participant agreement for each of the two trained observers was averaged to determine the rating that was used to compute the statistical analysis. This rating was converted into a trainedobserver/participant percentage of agreement for each sensory modality to evaluate each of the three null hypotheses.

Data analysis. The method of data analysis (see Appendix G) used was Cohen's K (kappa) (Cohen, 1960). Cohen's K utilizes a precalculated percentage of agreement to determine the probability that the agreement between raters of nominal data is occurring more than is expected by chance alone ($K=p_o-p_c/1-p_c$). The significance level for this analysis was set at alpha=.05. The first null hypothesis was evaluated by computing a Cohen's K for agreement between participant self reports of visual components in thought and trained observers' reports of eye movements posited by NLP theorists as indicating the presence of visual components in thought. The second null hypothesis was evaluated by computing a Cohen's K for agreement between participant self reports of auditory components in thought and trained observers' reports of eye movements posited by NLP theorists as indicating the presence of auditory components in thought. The third null hypothesis was evaluated by computing a Cohen's K for agreement between participant self

reports of kinesthetic components in thought and trained observers' reports of eye movements posited by NLP theorists as indicating the presence of kinesthetic components in thought.

CHAPTER III

RESULTS

Interrater agreement was calculated using Cohen's ***K*** for nominal data (Cohen, 1960) as recommended by Tinsely and Wiess (1975). As noted above, agreement between the two trained observers exceeded the predetermined minimal level of ***K***=.80. The trained observers agreed on 131 out of 144 ratings of participant eye movements which yielded an interrater agreement of ***K***=.82.

Taken together, the two trained observers agreed 43.5 out of 48 times with participant self reports of visual components in thought. The resulting coefficient of agreement between trained observers and participants was thus ***K***=.81, $p<.001$. This agreement exceeds the agreement expected by chance alone, therefore the first null hypothesis is rejected.

Taken together, the two trained observers agreed 38.5 out of 48 times with participant self reports of auditory components in thought. The resulting coefficient of agreement between trained observers and participants was ***K***=.65, $p<.001$. This agreement exceeds the agreement expected by chance alone, thus the second null hypothesis is rejected.

Taken together, the two trained observers agreed 20.5 out of 48 times with participant self reports of kinesthetic components in thought. This low agreement resulted in a negative value of ***K***=-.15, $p<.85$. The agreement does not exceed the level of agreement expected by chance alone, therefore the third null hypothesis is not rejected.

CHAPTER IV

DISCUSSION

Limitations

The most obvious limitation for the generalizability of the results of the study comes from the fact that all participants were right-handed. While eye movements appear to be reliable indicators of visual components in thought for both left and right-handed people (Buckner, 1984; Buckner & Meara, 1985), the usefulness of eye movements as indicators of auditory and kinesthetic components in thought for left-handed people is unknown.

Another limitation relates to the written instructions given to participants before the interview and the verbal instructions given during the interview. Because of such instructions, participants were informed twice that they could experience their thought in the visual, auditory, and/or kinesthetic modalities. It could be that many participants believed they were expected to represent their thought in more than one modality and consequently their thought patterns were not spontaneous. While the effect of such expectations on the actual thoughts of particpants is unknown, the usefulness of eye movements as indicators of sensory components in thought may be unaffected. In other words, if eye movements are reliable indicators of sensory components in thought, patterns should be identifiable regardless of expectations or suggestions. In addition, the fact that significance was found in two of the modalities, in spite of randomizing the order of suggested (a) visual, (b) auditory, and/or (c) kinesthetic components, could imply that actually suggesting the sensory components to participants is a more rigorous test than not suggesting them.

A third limitation concerns the sophistication of the trained observers. Since they were trained in NLP theory and in the rating of eye movements, the possibility exists that their ratings biased the results in favor of the theory. A more rigorous approach would be to have observers who are trained only to rate eye movements while being naive about NLP theory concerning the relationship between such eye movements and sensory components in thought. To eliminate as much bias as possible the method used here was to keep the trained observers naive to the design of the study and to eliminate the verbal content of the interviews from the tape segments they were asked to rate. While not perfect, this approach seems to be a reasonable one in attempting to control the bias. Since the trained observers heard no verbal content, performed their ratings independently, and reliably reported the same types of eye movements, it is believed that the opportunities for bias, while always possible, were minimized. Using highly trained observers may, in fact, allow a higher degree of internal validity and reliability than would be possible using observers trained for the study. Dorn et al (1983) indicate that differences among the skill levels of eye movement raters may have seriously affected the results of at least three previous studies into the NLP eye movement model (Thomason, et al., 1980; Falzett, 1981; Dorn et al., 1983).

Implications

NLP Theory. The results of the interrater agreement indicate that the trained observers consistently agreed with each other on the nominal designations of "visual, auditory, and kinesthetic" eye movements examined in this study. This agreement lends support to the NLP claim that observable eye

movement patterns are present and that experienced observers who are trained in NLP tend to agree on what types of eye movements are being exhibited by people they are observing. In addition, the rejection of null hypotheses one and two supports some of the most basic portions of the NLP eye movement model: visual and auditory components in a person's thought can often be identified by observing that person's corresponding eye movements.

The results do not support the efficacy of the NLP eye movement model as an indicator of kinesthetic components in thought. In fact, participants reported a kinesthetic component in thought more than twice as often as the trained observers indicated a corresponding eye movement. One possible reason for this lack of support may be simply that the kinesthetic portion of the eye movement model is not an accurate indicator of kinesthetic components in thought. While the coefficient of agreement was negative, it was not significantly negative, indicating that by using the eye movement model, the trained observers were able to identify kinesthetic components in thought no more or less than would be expected by chance alone.

A second possible reason for the lack of significance with the kinesthetic portion of the eye movement model may be found in a disagreement among NLP theorists about whether an eye movement down and to the right will accompany a feeling about a visual or an auditory component in thought for right-handed persons. Dilts (1983) claims that a memory accessed through a visual Lead System (LS) which is also represented kinesthetically will be indicated by an upward eye movement followed by an eye movement down and to the right for most right-handed people. Bandler (1985) claims that the

upward eye movement will be present in such a case, but implies that the eye movement down and to the right may not follow the upward or visual type of eye movement. Bandler holds that the kinesthetic component of the thought in such a case is a secondary element or an association with the visual component (a feeling about the image). Although Dilts (1983) and Bandler (1985) disagree on the probable sequence of eye movements in the example described above, they agree (Dilts, Grinder, Bandler, Bandler, & Delozier,1980) conceptually that such an association of visual and kinesthetic components exists. They call the association a "synesthesia" pattern.

Findings from procedural checks for a pilot study (Buckner, 1984) indicated support for Bandler's stance. Questions asked of participants about their current bodily experience, such as, "Which foot is warmer now?" were more likely to elicit eye movments identified by NLP theorists as kinesthetic than questions such as "How do you feel about your school program?" In other words, the eye movement model may not be an effective indicator of kinesthetic components which are "feelings about" images, sounds, tastes, or smells, but rather might indicate more about a person's accessing of current bodily awareness. The efficacy of the eye movement model as an indicator of such bodily awareness, however, has not been tested independently.

Value to Counselor in the Field. If, as NLP theorists (Dilts, 1983) and others (Segalowitz, 1983) indicate, eye movement patterns are subconscious neurological responses to brain activity, and are reliable indicators of visual or auditory components in thought as well, then counselors in the field may have a tool to aid in understanding a client's internal processes. For example, if a client, claiming to feel sad about some unknown factor, moves his/her eyes

upward each time the counselor asks, "What are you feeling sad about?", there is a likelihood that the sad feeling has a visual component. The realization that this visual component is present can aid the client and the counselor in developing awareness and insight into what the client is "sad about." In a similar manner, if a counselor notices lateral eye movements or eye movements down and to the left occuring frequently during the session, the possibility of auditory processing or of an internal dialog can be explored with the client. Thus, a counselor can utilize the client's eye movement patterns to indicate ongoing visual or auditory thoughts to facilitate the counseling process.

Recommendations for Future Research

Some logical suggestions for future research endeavors arise from the limitations of this study. Eye movement patterns are yet to be explored for left-handed people. A systematic replication of this study could enlist left-handed participants thus allowing comparisons to be made between the eye movement patterns of right and left-handed people.

Since the effect of suggesting that participants concentrate in (a) visual, (b) auditory, and/or (c) kinesthetic thoughts is unknown, future research exploring eye movement could utilize a participant self-report without prior suggestion of all three sensory modalities. Such research might be facilitated by eliciting more descriptive information from participants as opposed to "yes" or "no" responses to questions about the presence of sensory components in thought. An example of such question is, "Can you describe your thought like you might describe an experience in one or more or your five senses?".

In order to further explore the kinesthetic portion of the eye movement model other research methodologies may be needed. If, as Bandler (1985) claims, that eye movement down and to a person's right (for most right-handed persons) indicates accessing bodily awareness rather than emotions or feelings about (a) images, (b) sounds, (c) tastes, and/or (d) smells, then one possible direction for future researchers is to record eye movements as research participants attempt to identify or to distinguish among vague bodily sensations introduced by the researcher. For example, to minimize cognition about such stimuli, a research could sequentially touch two places on a participant's body and out of the participant's field of vision. The researcher could then touch one of the places again and ask if the touch corresponds to the first or second place touched.

If research continues to verify the existence of patterns between eye movements and sensory components in thought, possible future studies could track the sequencing of eye movements. Such sequences could be evualuated in light of and compared to participant self-reports and to specific types of cognitive tasks such as those involved in different types of learning, like the different kinds of learning involved in mathematics as opposed to spelling.

One of the most basic tenets of Neuro-Linguistic Programming is the eye movement model which is explored within this study. NLP is a therapeutic orientation with wide appeal, yet many of the tenets of NLP have not been adequately explored by resarchers. Future researchers can best serve the psychological community by first exploring the NLP approach to counseling at its most elementary levels. The eye movement model is such a level. Another

basic level is the construct of Primary Representational Systems (PRS) which could be explored through observation of sensory based language. A third basic level is the NLP method establishing of rapport through having counselors mirror such things as client posture, breathing rate, PRS language, and tonal shifts. As basic levels of NLP are explored, a foundation can be provided for the study of more complex issues such as NLP interventions and techniques.

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APPENDICES

APPENDIX A

Participant Information Sheet (Form 1)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can hear the sound of a friend's voice. Some can see the image of a place they have been. Some can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

If you would like to receive a report about the results of this study simply fill out the address portion of your Statement of Consent Form.

Thank you for your participation.

Participant Information Sheet (Form 2)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can hear the sound of a friend's voice. Some can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. Some can see the image of a place they have been. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

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Thank you for your participation.

Participant Information Sheet (Form 3)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can see the image of a place they have been. Some can hear the sound of a friend's voice. Some can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

If you would like to receive a report about the results of this study simply fill out the address portion of your Statement of Consent Form.

Thank you for your participation.

Participant Information Sheet (Form 4)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can see the image of a place they have been. Some can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. Some can hear the sound of a friend's voice. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

If you would like to receive a report about the results of this study simply fill out the address portion of your Statement of Consent Form.

Thank you for your participation.

Participant Information Sheet (Form 5)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. Some can see the image of a place they have been. Some can hear the sound of a friend's voice. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

If you would like to receive a report about the results of this study simply fill out the address portion of your Statement of Consent Form.

Thank you for your participation.

Participant Information Sheet (Form 6)

You are taking part in a study which involves thinking and remembering. You will be asked to concentrate in silence about a single pleasant thought or memory. As you concentrate, the interviewer will interrupt you and ask about your particular thought at that moment. Because the interviewer will ask you what you are thinking about you can refuse to give any thought content which you prefer to keep private.

One method of describing thoughts is in terms of our five senses. You will be asked to answer some sensory based questions about your thought or memory. When thinking, for example, some people can feel again the temperature of a warm or cool day. Some can re-experience an emotional feeling. Some can hear the sound of a friend's voice. Some can see the image of a place they have been. After you briefly describe your thought, you will be asked about what you hear, see, or feel within your thought or memory.

If you would like to receive a report about the results of this study simply fill out the address portion of your Statement of Consent Form.

Thank you for your participation.

APPENDIX B

Interviewer Instructions, Statements, and Questions

You will interview participants one at a time in Room 14-D of Claxton Education Building. Participants who are waiting will gather in Room 14. The experimenter will take the responsibility of giving participants the Participant Information Sheet and the Statement of Consent Form.

As you recieve a participant into the interview rom, ask him/her to sit in the participant chair while the camera operator focuses and frames the camera. When you are sure the camera operator is ready to proceed, you may begin the interview.

Please use the following statements and questions. "In a moment I will ask you to concentrate on a thought or memory which is pleasant for you. After you concentrate for a few moments I will then ask you to tell me what the thought or memory is about."

Continue by saying, "Then, after you have described your thought or memory, I will ask you three questions." (At this point you need to check the order of the next three questions. Simply check the number of your current participant and get the question from your "Question Ordering List." You have a "hearing" question, a "Seeing" question, and a "Feeling" question for each participant. The questions are: "Are you aware, in your thought, of hearing anything?", "Are you aware in your thought of seeing anything?", and "Are you aware, in your thought, of feeling anything like a touch or an emotion?"

Then ask the participant, "Are you ready?". If the participant is unable to come up with a thought offer him/her a copy of the "Some Possible thoughts/Memories" Sheet. When the participant is ready, begin by saying, "Please begin to concentrate now." At this point begin watching the wall mounted timer behind the participant chair. When 10 seconds have passed, then say to the participant, "Now, if you are willing, I would like you to describe your thought." If the participant interrupts your timing of his.her concentration with a comment such as "O.K. or "Alright", indicating he/she is finished concentrating, simply make the request for the participant to describe his/her thought or memory.

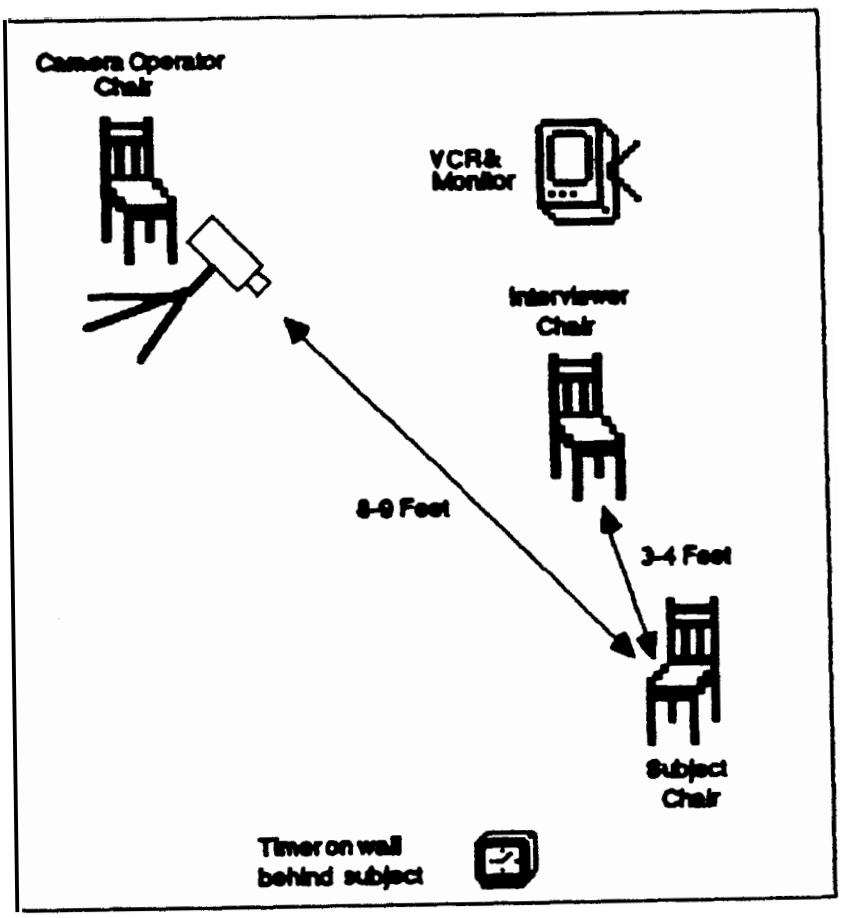
After a brief description by the participant of his/her thought or memory, ask the 3 questions that you repeated during the instruction in the same order you used in the instruction. "Are you aware, in your thought, of _____ anything?" Simple answers are adequate for these questions.

After the participant has answered these questions, please thank each participant for his/her participation and dismiss him/her.

The same process is repeated for each participant.

APPENDIX C

Diagram of Interview Room



APPENDIX D

Statement of Consent

I understand that this study relates to thinking and remembering. I have been informed that my responses within the interview will be treated confidentially, and that any research report of the results will protect my anonymity. I understand that I will be videotaped during the interview. I also understand that my participation in the study is voluntary, and that I have the right to withdraw as a participant at any time without penalty. If I choose to withdraw from the study I understand that I will still receive any extra class credit which may have been offered to me for participation in this study.

Signature_____

Date _____

_____

_____

Place address above if you would like a report of the results of the study.

APPENDIX E

Some Possible Thoughts/Memories:

A trip, vacation, place

A person, friend, relative

A made-up thought or fantasy

This list is simply an idea generator. It is not to suggest limits.

APPENDIX F

Raw Data

+ signifies either a report of "yes" for Subjects indicating the modality was self reported or signifies"√" recorded by Observers indicating the observation of an eye movement corresponding to the modality

Subject #	Visual			Auditory			Kinesthetic		
	Ss	Obs 1	Obs 2	Ss	Obs 1	Obs 2	Ss	Obs1	Obs 2
1	+	+	+	+	+	+	+		
2	+	+	+	+	+	+	+		
3	+	+	+	+	+	+	+		
4	+	+	+	+	+		+	+	+
5	+	+	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+	+	
7	+	+	+	+	+	+			
8	+	+	+	+	+	+	+		
9	+	+	+		+	+	+	+	+
10	+	+	+	+	+	+	+		
11	+	+	+				+		
12	+	+	+	+	+	+	+		
13	+	+	+		+		+		
14	+	+	+	+	+	+	+		
15	+	+	+	+	+	+	+		
16	+	+	+	+	+	+	+		

Raw Data

+ signifies either a report of "yes" for Subjects indicating the modality was self reported or signifies"√" recorded by Observers indicating the observation of an eye movement corresponding to the modality

Subject #	Visual			Auditory			Kinesthetic		
	Ss	Obs 1	Obs 2	Ss	Obs 1	Obs 2	Ss	Obs1	Obs 2
17	+	+				+	+		
18	+	+	+	+	+	+	+	+	+
19	+	+	+	+	+	+	+	+	
20	+	+	+		+	+			+
21	+	+	+	+	+	+	+	+	+
22	+			+	+	+	+		+
23	+	+	+		+	+	+		
24	+	+	+	+			+		+
25	+	+	+	+	+	+	+	+	+
26	+	+	+	+	+	+	+		
27		+				+	+	+	
28	+	+	+	+	+	+	+		
29	+	+	+	+	+	+	+		
30	+	+	+	+					
31	+	+	+	+	+	+	+	+	+
32	+	+	+	+	+	+	+		

Raw Data

+ signifies either a report of "yes" for Subjects indicating the modality was self reported or signifies"√" recorded by Observers indicating the observation of an eye movement corresponding to the modality

Subject #	Visual			Auditory			Kinesthetic		
	Ss	Obs 1	Obs 2	Ss	Obs 1	Obs 2	Ss	Obs1	Obs 2
33	+	+	+	+	+	+	+		
34	+				+	+	+		
35	+			+	+	+		+	+
36	+	+	+	+	+	+			
37	+	+	+	+	+	+	+	+	
38	+	+	+	+	+	+	+	+	+
39	+	+	+	+	+	+	+	+	+
40	+			+	+	+			
41	+	+	+		+	+	+		
42	+		+	+	+	+	+	+	+
43	+	+	+						
44	+	+	+	+	+	+			
45	+	+	+	+	+	+	+		
46	+	+	+	+	+	+	+		
47	+	+	+	+	+	+	+		+
48	+	+	+	+			+		

APPENDIX G

Data Analysis Method

1. A frequency of agreement was determined for each of the two trained observers.
2. Interrater reliability was computed using Cohen's ***K*** (Tinsley & Weiss, 1975).
3. Since $K \geq .80$, the frequency of agreement for the two trained observers was averaged into a single rating for each of the three sensory modalities.
4. The single rating was converted into a percentage of agreement for each sensory modalilty.
5. Utilizing the percentage of agreement for each sensory modality, a Cohen's ***K*** (Cohen, 1960) was computed to determine the coefficient of agreement for each of the sensory modalities.
6. A test for significance was computed for each of the three hypotheses (Hoel, 1960. The significance level was preset at alpha = .05.

VITA

Michael Orval Buckner was born in Asheville, North Carolina on November 1, 1951. He attended public schools in New York state and in East Tennessee. He was graduated from Morristown Hamblen High School West in May 1969. The following September he entered the University of Tennessee at Knoxville, and in June 1973 he received a Bachelor of Arts Degree in philosophy. In August 1973 he entered the Divinity School at Duke University, and in May 1979 he received a Master of Divinity Degree. In June 1973 Michael received a student pastoral appointment with the United Methodist Church, and in June 1980 he was ordained as an Elder within that denomination.

He continued serving pastoral appointments in rural and in urban settings until September 1982 when he entered doctoral study in counseling psychology at the University of Tennessee at Knoxville. After a two year half-time internship at the University of Tennessee Student Counseling Center he received his Ph. D. in education in June, 1986.

Currently the author is a psychological examiner in private practice with the Center for Psychology and Counseling in Knoxville, Tennessee, is the Minister of Counseling with Church Street United Methodist Church in the same city, and is the director of the Center for Neuro-Linguistic Studies. After graduation Mr. Buckner will seek licensure as a psychologist by the Tennessee Board of Healing Arts.