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# Eye Movement as an Indicator of Sensory Components in Thought

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This study investigated a claim of the Neuro-Linguistic Programming (NLP) eye movement model, which states that specific eye movements are indicative of specific sensory components in thought. Forty-eight graduates and undergraduates were asked to concentrate on a single thought while their eye movements were videotaped. They were subsequently asked to report if their thoughts contained visual, auditory, or kinesthetic components. Two NLP-trained observers independently viewed silent videotapes of participants concentrating and recorded the presence or absence of eye movements posited by NLP theorists to indicate visual, auditory, or kinesthetic components in thought. Coefficients of agreement (Cohen's K) between participants' self-reports and trained observers' records indicate support for the visual (K = .81, $p < .001$) and auditory (K = .65, $p < .001$) portions of the model. The kinesthetic (K = −.15, $p < .85$) portion was not supported. Interrater agreement (K = .82) supports the NLP claim that specific eye movement patterns exist and that trained observers can reliably identify them.

Proponents of Neuro-Linguistic Programming endorse an eye movement model that they claim enables an observer to know when a person is accessing or experiencing thoughts containing any or all of three sensory components: (a) visual, (b) auditory, and/or (c) kinesthetic. They claim that careful observation of eye movements can reveal meaningful cognitive patterns such as those associated with feelings of depression or confusion or those associated with feelings of confidence or comfort. This study examined the basic tenets of the eye movement model, which states that specific eye movements are indicative of when a person is thinking visually, aurally, and/or kinesthetically.

During the last 12 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 (a) the NLP eye movement model, which is the focus of this study, and (b) the NLP claim for a primary (or preferred) representational system (PRS).

NLP theorists propose that all people 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, 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 either the sensory modality accessed (LS) or the sensory modality employed (RS) at a given moment. Bandler (1978), Dilts (1983), and R. B. Dilts (personal communication, August 20, 1983) assert, however, that eye movements should not be used to determine an individual's PRS. Since eye movements can indicate activity within either an LS or an RS, the two are not distinguishable simply by counting eye movements to determine which type occurs most frequently. Determining PRS usually requires some linguistic information such as sensory-based predicates.

A number of previous studies (Beale, 1981; Dorn, Atwater, Jereb, & Russell, 1983; Ellickson, 1981; Falzett, 1981; Graunke & Roberts, 1985; Gumm, Walker, & Day, 1982; Hernandez, 1981; Owens, 1978; Thomason, Arbuckle, & Cady, 1980) employed eye movements to determine PRS. There appear to be fundamental problems with such an approach. These studies used the untested NLP eye movement model to find PRS, and as noted above, NLP theorists state that PRS cannot be determined by eye movements. It seems that at this stage of NLP, to theorize a more logical direction for research is to ascertain initially whether posited

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eye movements can be reliably recorded and then to determine if such movements are related to sensory-specific cognitive processing.

To date the only research published that has examined the NLP eye movement model independent of PRS is that of Dilts (1983), who used an electroencephalograph (EEG) to record electro-ocular activity and cortical activity and attempted to correlate specific eye movements with activity within specific cortical areas. His study yielded incomplete results, but he concluded that the eye electrodes were less satisfactory than videotape equipment for plotting eye movements. Furthermore, he found that eye movements did not correlate directly with brain wave patterns from EEG readings, but he did observe a strong relation between eye movement patterns and sensory-specific cognitive tasks.

Dilts (1983) suggests that future studies exploring the NLP eye movement model should use videotaping to evaluate eye movements and use 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 or her internal experience in terms of the sensory components of the experience. This study implements the approaches suggested by these theorists.

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 movements 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. Since Dilts et al. (1980) imply that left-handed people are less likely to fit a single model, participants were limited to those self-reporting as right-handed. In addition, the approach of this study is not to assume that either idiosyncratic or global eye movement patterns exist, but rather to explore the possibility of the presence of a single pattern across right-handed participants.

## Method

### Participants

Participants for the study ($N$ = 48) were 34 graduate and 14 undergraduate students from educational psychology classes at a large southeastern university. There were 28 women and 20 men; all participants were right-handed. 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 determined by computing a 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 was also validated by a review of data from a pilot study (Buckner & Meara, 1985).

### Procedure

*Pilot studies.* Two pilot studies (Buckner, 1984; Buckner & Meara, 1985) revealed procedural difficulties that could confound results. Steps were taken to avoid these difficulties. In the first study participants were given what were assumed to be sensory-specific tasks. The participants' eye movements were rated by a trained observer, who was viewing them 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, and one cannot be certain that a task that appears to a researcher to be sensory-specific is in fact sensory-specific for participants. To avoid this problem, the current study was designed so that participants would be asked to concentrate on a single thought. (See *Instructions* below.)

The findings of the first pilot study also suggested that more than one sensory modality was often employed for a given thought. Unless asked about other modalities, however, participants tended to describe only one. Thus, the decision was made to ask each participant about all three modalities.

*Instructions.* Participants were given Participant Information Sheets that described what would happen in the study and that provided examples of what was expected from them. Participants were informed that they would 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. To reduce the possibility of raising anxiety or causing embarrassment it was decided to specify that the thought be pleasant. The Participant Information Sheet also gave a brief example of (a) a visual component in thinking, such as seeing an image of a place where one has 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, which contained 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.

*Interview.* Participants were asked to enter a small interview room one at a time and to be seated directly in front of and about 3 ft (1 m) from an interviewer. Participants were seated at a slight angle and about 8 ft (2.5 m) from a video camera that was focused on each participant'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 10 s 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. For each of these questions all of the participants answered in the affirmative or in the negative, indicating the presence or absence of each of the sensory components in their thought.

The interviewer was trained by the principal investigator to use only this prepared set of requests and questions. The interviewer had no knowledge of the design of or expectation for the study. 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.

The materials for the interview included (a) an interviewer script; (b) a 10 × 10-ft (3 m × 3 m) interview room containing one chair each for the participant, interviewer, and camera operator; (c) a wall-mounted timer that indicated seconds; (d) video equipment including a video camera with tripod, video cassette recorder, a television monitor, and a microphone; (e) six forms of the Participant Information Sheet described above; (f) participant release forms for each participant; and (g) a sheet of "Some Possible Thoughts/Memories" if needed. This last item was given to the interviewer to be used as a prompt for any participant who was unable to generate a thought. In a prior pilot study (Buckner & Meara, 1985), 1 participant out of 56 needed such assistance. The interviewer did not need to use the prompt in the present study.

## *Videotape Preparation and Measures*

The study used two trained observers who had been certified as trainers by the Society of Neuro-Linguistic Programming. Each trained observer independently viewed silent videotaped segments of the participants. 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 instructed by the principal investigator 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. As noted earlier, these are the NLP posited eye movements for the visual, auditory and kinesthetic modalities, respectively. 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 visual, auditory, and kinesthetic. The trained observers worked independently, and each was instructed to make a single check in the appropriate column and row if he or she observed any eye movements posited as being visual, auditory, or kinesthetic. While the trained observers were asked only to report the presence of specified eye movements, the result of their ratings was a record of the presence or absence of the posited eye movements for each modality for each participant.

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. They had no direct knowledge, however, of the design of the study or the content or sequence of the interviewer's questions.

Prior to the study, the trained observers were evaluated by the principal investigator. This evaluation involved having each trained observer watch and rate the eye movements of 10 pilot study (Buckner & Meara, 1985) participants from a prerated silent videotape. Each trained observer exceeded 90% agreement with the preestablished ratings for the silent videotape. At this time an interrater agreement level of 90% was established for the current study as the minimum necessary for the ratings to be considered reliable and for them to be combined in the main data analysis. Using Cohen's kappa (Cohen, 1960), the level of interrater agreement between the two trained observers was thus set at 80, which reflects an actual agreement of 90%, adjusted by possible agreement due to chance. (See description of Cohen's kappa in *Data Analysis* below.) Participant self-reports were compiled by reviewing the videotaped interviews and noting whether the participants, in response to the interviewer's questions, reported the presence or absence of sensory components for each of the three modalities.

Participant self-reports were compared with trained observers' records for frequency of agreement between the presence or absence of reported sensory components and the presence or absence of the posited corresponding eye movements for each modality. 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. The data were converted to a percentage of agreement between trained observers' records and participant self-reports for each sensory modality.

## *Data Analysis*

As recommended by Tinsley and Weiss (1975), Cohen's kappa (Cohen, 1960) was used to determine interrater agreement between the two trained observers. It was also used for the main analyses comparing the percentage of agreement between the trained observers' records and the participants' self-reports for each of the sensory modalities. Cohen's kappa was specifically designed for use in judging nominal data and utilizes a precalculated percentage of agreement to determine the probability that the agreement between raters is occurring more than is expected by chance alone ($K = p_o - p_c/1 - p_c$).

Each of the three modalities was evaluated by means of a null hypothesis. Each of the three null hypotheses was tested by computing a Cohen's kappa for agreement between participants' self-reports of the specified sensory component in their thought (i.e., visual, auditory, or kinesthetic) and trained observers' records of eye movements posited by NLP theorists as indicating the presence of that component. The significance level was set at $\alpha = .05$.

# Results

The trained observers agreed on 131 out of 144 ratings of participant eye movements, which yielded an interrater agreement of $K = .82$. Since the interrater agreement between the two trained observers exceeded the predetermined minimal level of $K = .80$, their ratings were combined for the remaining analyses.

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; therefore, 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.

## Discussion

There are several limitations of this study. The participants are all right-handed. They are highly educated people who were able to comprehend abstract directions and to respond to sensory awareness questions. Controls for internal validity, such as the precise directions, may have set forth demand characteristics which diminished the spontaneity of the participants' thought patterns. Lack of spontaneity might not hinder the research endeavor, but for the NLP eye movement model to be useful in counseling, the counselor must be able to judge the eye movements related to spontaneous thought. In addition, a client needs to be aware of sensory components in spontaneous thought. But for the moment, the prior question of relation between self-report and observed eye movements does not seem unduly compromised by the methodology.

The use of trained observers highly sophisticated in NLP theory and highly experienced in rating eye movements might be seen as introducing undue bias. Dorn et al. (1983), however, 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). Although this procedure was used to overcome difficulties reported in prior work and to strengthen reliability and internal validity, it does bring with it its own kind of limitation.

Despite these limitations, the results of the study have implications for researchers, theoreticians, and practitioners of NLP. 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 can agree on what types of eye movements are being exhibited by persons whom they are observing. In addition, the rejection of two of the three null hypotheses supports some basic assumptions of the NLP eye movement model; namely, that visual and auditory components in a person's thought can often be identified by observing that person's eye movements. As noted above, support for these assertions is an important foundation for further empirical work with both the eye movement model and exploratory studies related to examining the construct of a PRS.

The results clearly do not support the NLP eye movement model as an indicator of kinesthetic components in thought. A possible reason for this finding 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) that 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 one of the pilot studies (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 movements 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 that 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.

If eye movement patterns are reliable indicators of visual or auditory components in thought, then counselors in the field may have a tool to aid in understanding a client's internal processes. For example, the realization that a visual component is present can aid the client and the counselor in developing a strategy for probing awareness or recalling blocked images. It would be important for the counselor to know what, if anything, is signified by the eye movements posited to correspond to kinesthetic components in thought. Strategies to enhance bodily awareness would be different from strategies to explore feelings about images or sounds.

Some logical suggestions for future research arise from the limitations of this study. 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.

Because the effect of suggesting sensory modalities of thoughts to subjects is unknown, future research exploring eye movements could employ a more spontaneous participant self-report without prior suggestion of specific sensory modalities. Such research might be facilitated by eliciting more descriptive information from participants. An example of such information might be generated by a question such as, "Can you describe your thought as you might describe an experience in one or more of 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, eye movement down and to a person's right (for most right-handed persons) indicates accessing bodily awareness, one might record eye movements of the participants as they attempt to identify or to distinguish among vague bodily sensations introduced by the researcher.

Future researchers might also control for the effects, if any, of the interviewer's eye movements. This seems particularly important because participants reported a kinesthetic component in thought more than twice as often as the trained observers indicated a corresponding eye movement. It is conceivable that although participants' thoughts were not influenced by the interviewer, their eye movements were. Future researchers could either make note of interviewer eye movements or arrange the experimental situation so the participants do not have direct eye contact with the interviewer.

If research continues to verify the existence of patterns between eye movements and sensory components in thought, future studies could track the sequencing of eye movements. Such sequences could be evaluated 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.

NLP is a therapeutic orientation with wide appeal, yet many of the tenets of NLP have not been adequately explored by researchers. 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 by 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.

## References

Bandler, L. (1978). *They lived happily ever after.* Cupertino, CA: Meta Publications.

Bandler, R. (1985, February). *Mind and body synthesis.* Paper presented at the Annual Conference of the Southern Institute of Neuro-Linguistic Programming, Clearwater, FL.

Bandler, R., & Grinder, J. (1975). *The structure of magic I.* Palo Alto, CA: Science and Behavior Books.

Beale, R. (1981). The testing of a model for the representation of consciousness. *Dissertation Abstracts International, 41,* 3565B. (University Microfilms No. 81-06, 799).

Beck, C., & Beck, E. (1984). Test of the eye-movement hypothesis of Neurolinguistic Programming: A rebuttal of conclusions. *Perceptual and Motor Skills, 58,* 175–176.

Buckner, M. (1984). *Use of eye movements as an indicator of visual components in thought.* Unpublished manuscript.

Buckner, M., & Meara, N. M. (1985). *Use of eye movements as an indicator of visual components in thought.* Manuscript submitted for publication.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20,* 37–46.

Cohen, J. (1965). Some statistical issues in psychological research. In B. B. Wolman (Ed.), *Handbook of Clinical Psychology* (pp. 95–121). New York: McGraw-Hill.

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences.* New York: Academic Press.

Dilts, R. (1983). *Roots of Neuro-Linguistic Programming.* Cupertino, CA: Meta Publications.

Dilts, R., Grinder, J., Bandler, R., Bandler, L., & Delozier, J. (1980). *Neuro-Linguistic Programming* (Vol. 1). Cupertino, CA: Meta Publications.

Dorn, F., Atwater, M., Jereb, R., & Russell, R. (1983). Determining the reliability of the NLP eye-movement procedure. *American Mental Health Counselors Association Journal, 5,* (3), 105–110.

Ellickson, J. (1981). The effect of interviewers responding differentially to participants' eye movement. *Dissertation Abstracts International, 41,* 2754B. (University Microfilms No. 81-01, 102)

Falzett, W. (1981). Matched versus unmatched primary representational systems and their relationship to perceived trustworthiness in a counseling analogue. *Journal of Counseling Psychology, 28,* 305–308.

Graunke, B., & Roberts, K. (1985). Neurolinguistic Programming: The impact of imagery tasks on sensory specific predicate usage. *Journal of Counseling Psychology, 32,* 525–530.

Grinder, J., & Bandler, R. (1976). *The structure of magic II.* Palo Alto, CA: Science and Behavior Books.

Gumm, W., Walker, M., & Day, H. (1982). Neurolinguistics programming: Method or myth? *Journal of Counseling Psychology, 29,* 327–330.

Harmon, R., & O'Neill, C. (1981). Neurolinguistic Programming for counselors. *Personnel and Guidance Journal, 59,* 449–453.

Hernandez, V. (1981). A study of eye movement patterns in the Neuro-Linguistic Programming model. *Dissertation Abstracts International, 42,* 1587B. (University Microfilms No. 81-20, 505)

Owens, L. (1978). An investigation of eye movements and representational systems. *Dissertation Abstracts International, 38,* 4992B. (University Microfilms No. 78-03, 828)

Sharpley, C. (1984). Predicate matching in NLP: A review of research on the preferred representational system. *Journal of Counseling Psychology, 31,* 238–248.

Thomason, T. C., Arbuckle, T., & Cady, D. (1980). Test of the eye movement hypothesis of neurolinguistic programming. *Perceptual and Motor Skills, 51,* 230.

Tinsley, H., & Weiss, D. (1975). Interrater reliability and agreement of participative judgements. *Journal of Counseling Psychology, 22,* 358–376.

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