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EFFECTS OF TIME PARAMETERS ON THE MEASUREMENT OF TEACHERS' VERBAL BEHAVIOR PATTERNS USING THE FLANDERS SYSTEM OF INTERACTION ANALYSIS

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Norman, Oklahoma

1969

EFFECTS OF TIME PARAMETERS ON THE MEASUREMENT OF TEACHERS' VERBAL BEHAVIOR PATTERNS USING THE FLANDERS SYSTEM OF INTERACTION ANALYSIS

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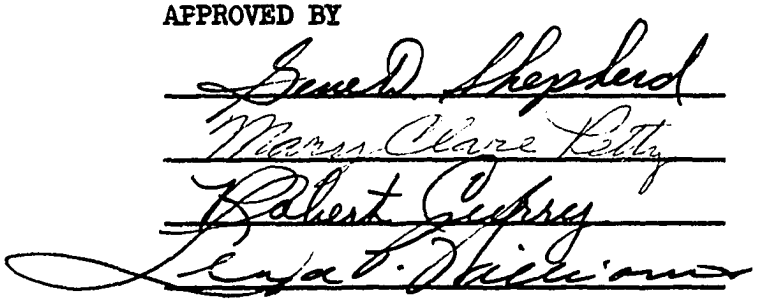

DISSERTATION COMMITTEE

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CHAPTER I

INTRODUCTION

Educators have long desired and sought to improve the teaching-learning, or instructional, process. Motivated by the awareness that the quality of living in modern, complex, technological societies is greatly affected by the quality of the teaching-learning process, educators have arduously and critically examined this process seeking to gain a more comprehensive understanding of it.

For many years educators have centered their research on the learning aspect of the instructional process. These researchers have used many and diverse research designs, instruments, and techniques in attempting to determine specific conditions under which learning is maximized. From these attempts have come many insights into the instructional process.

Interaction analysis, a systems approach of identifying, classifying, and quantifying the classroom verbal interaction of teachers and students, has emerged to prominence during the last decade as a tool for obtaining research data. This systems approach provides researchers with a new means to understanding the instructional process.

Simon and Boyer[1] list and describe twenty-six of the fifty-plus interaction analysis systems which have been developed to date. They classify each system as "affective," "cognitive," or both, depending on whether the system deals with the emotional climate of the classroom, and/or with the thinking process itself. Each system is different, and derives its peculiarities from the purposes of the person who created the system. All systems are similar in that all have several categories of verbal behavior and methods of collecting, recording, and interpreting data. No system is purported to be complete enough to measure all of the significant aspects of classroom interaction, but each system measures some aspect of it.

In the early 1950's at the University of Minnesota, Flanders developed what Medley and Mitzel[2] have called the most sophisticated interaction analysis system thus far developed. This system known as the Flanders System of Interaction Analysis (FSIA) is described by Flanders as:

> . . . a method of observation . . . used to quantify the qualitative aspects of verbal communication. The entire process becomes a measure of teacher influence because it makes the assumption that most teacher influence is expressed through verbal statements and that most nonverbal influence is positively correlated with the verbal . . . An analysis of spontaneous communication between individuals . . . Of the total

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[1]Anita Simon and E. Gil Boyer, eds., Mirrors for Behavior: An Anthology of Classroom Observation Instruments (Philadelphia, Penn.: Research for Better Schools, Inc., 1967), pp. 1-16.

[2]D. M. Medley and H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," in Handbook of Research on Teaching, ed. by N. L. Gage (New York: Rand-McNally, 1963), p. 271.

> complex called 'teaching,' interaction analysis applies only to the content-free characteristics of verbal communication.[3]

Simon and Boyer[4] describe the Flanders system as an "affective" system concerned with the emotional climate of the classroom. They further indicate that this system is primarily concerned with the "how" of teaching and learning since it is "content-free" and can be used with any subject.

(For a brief description of the FSIA categories, the procedure for categorizing teacher-pupil interaction, and the procedure for using and interpreting the data, see Appendix A.)

Background of Problem

The Flanders system has been used extensively as a research tool. The early research using the FSIA was designed to relate children's attitudes to patterns of teacher verbal behavior. Later research was designed to determine the relationship between student achievement and teacher verbal behavior patterns. And recently, research has been designed to determine the effects of interaction analysis training on student teachers.[5]

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[3]Ned A. Flanders, "Some Relationships Among Teacher Influence, Pupil Attitudes and Achievement," Contemporary Research on Teacher Effectiveness, ed. by Bruce J. Biddle and William J. Ellena (New York: Holt, Rinehart, and Winston, Inc.), reprinted in Interaction Analysis: Theory, Research, and Application, ed. by Edmund J. Amidon and John B. Hough (Reading, Mass.: Addison-Wesley Pub. Co., 1967), pp. 218-19.

[4]Simon and Boyer, op. cit., p. 2.

[5]Edmund Amidon, "Interaction Analysis and Its Application to Student Teaching," Theoretical Bases for Professional Laboratory Experiences in Teacher Education, Forty-Fourth Yearbook of the Assn. for Student Teaching (Dubuque, Ia.: W. C. Brown Co., Inc., 1965), pp. 71-92.

In analyzing the research, no consistency is found in the time parameters of observations when the Flanders system is used. The number of observations varies among studies, as do the lengths of observations, and many times the lengths of observations vary within a study. The inconsistencies are illustrated by the following research studies.

Moskowitz[6] studied the effects of interaction analysis training on the attitudes and teaching patterns of cooperating teachers and student teachers. By observing forty-four cooperating teachers and forty-four student teachers two times each (the lengths of the observations were not included in the report of the study), she found that both student and cooperating teachers trained in interaction analysis used significantly more indirect teaching patterns than those student and cooperating teachers without such training. (Indirect and direct teaching patterns are determined by calculating I/D ratios. See Definitions: I/D Ratio.)

Lohman[7] observed sixty student teachers for twenty minutes each on six different occasions during a ten-week period to determine the effects of pre-service training in interaction analysis on the verbal behavior of student teachers. He found that student teachers trained in interaction analysis lectured less, used less direct teacher talk and more indirect teacher talk, better accepted and clarified student ideas, and encouraged more spontaneous student talk.

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[6]Gertrude Moskowitz, "The Attitudes and Teaching Patterns of Cooperating Teachers and Student Teachers Trained in Interaction Analysis," Interaction Analysis: Theory, Research and Application, ed. by Edmund J. Amidon and John B. Hough (Reading, Mass.: Addison-Wesley Pub. Co., 1967), pp. 271-282.

[7]Ernest E. Lohman, "A Study of the Effect of Pre-service Training in Interaction Analysis on the Verbal Behavior of Student Teachers," Dissertation Abstracts, XXVII (March, 1967), 2922.

Yulo[8] used the FSIA as a supervisory device with intern science teachers. Through the internship period fourteen teachers were observed six times each to find if training in interaction analysis affected the verbal behavior patterns of the intern teachers. (The length of each observation was not mentioned.) His findings indicated that the verbal behavior patterns of the interns were not significantly affected by interaction analysis training.

McLeod[9] became interested in the effect of student teachers with training in interaction analysis on their cooperating teachers. He observed each of the student teachers for six hours--two hours at the beginning, two hours in the middle, and two hours at the end of the student teaching period. He noted that student teachers with training in interaction analysis exerted more indirect teacher influence than those without training. He also found that student teachers with training changed the most during the first half of the student teaching period, while those student teachers without training increased their change rate most during the second half of student teaching. But student teachers, with or without training, changed to patterns which were very similar to their cooperating teachers. The changes that each of the two groups of student teachers made were changes that decreased the number of differences between them.

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[8]Ralph J. Yulo, Jr., "An Exploration of the FSIA as a Supervisory Device with Science Teachers," Dissertations Abstracts, XXVIII (August, 1967), 528.

[9]Richard J. McLeod, "Changes in the Verbal Interaction Patterns of Secondary Science Student Teachers Who Have Had Training in Interaction Analysis and the Relationship of These Changes to the Verbal Interaction of Their Cooperating Teachers," Dissertation Abstracts, XXVIII (July, 1967), 145.

Dickman[10] used an extensive amount of observation time when she employed the Flanders system for her study. She was also interested in the effect of interaction analysis training on teacher classroom verbal behavior. She observed each teacher two different times and each time for two complete days. She analyzed the total talk for the two complete days of observations without regard to time, and found no significant difference between teachers with interaction analysis training and those without interaction analysis training.

Furst and Amidon[11] analyzed the verbal behavior patterns of elementary teachers. Their research involved teachers at each grade level, and teachers in each of the subject areas of arithmetic, social studies, and reading. They found that, overall, first and second grade teachers use more indirect than direct statements; third and fourth grade teachers use more direct than indirect influence in arithmetic and reading, and vice versa in social studies; and fifth and sixth grade teachers are more direct than indirect. Percentage of teacher talk varied little from grade to grade, but the percentage of student talk decreased steadily between grades one and six. They further found that student achievement was greater when student talk and indirect teacher influence were greater.

An analysis of the procedure used by Furst and Amidon in their research project shows that of the 160 teachers observed, no more than

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[10]Lenore W. Dickman, "Education of Intern Teachers: An Experiment With Interaction Analysis," Dissertation Abstracts, XXVIII (May, 1968), 4507-8.

[11]Norma Furst and Edmund Amidon, "Teacher-Pupil Interaction Patterns in the Elementary School," Amidon and Hough, op. cit., pp. 167-175.

ten of the teachers could have been observed more than two times. One-hundred fifty teachers were observed one time each. The lengths of the observations ranged from thirty to forty-five minutes.

The available literature surveyed does not contain empirical data about time parameters which indicate how long observations should be, or how many observations are necessary to obtain consistent measures of verbal behavior patterns of teachers. It does contain a statement by Amidon about time parameters, but the statement is not accompanied nor supported by empirical data, gives only a range of time for observations, and does not indicate the specific effects time has on measured verbal behavior patterns of teachers. Amidon states:

> . . . He (teacher) will also want to assure an adequate sample of his total behavior pattern by collecting data during several different types of lessons and by making certain that the length of time of each observation, as well as the total amount of time spent in observation, is sufficient. A single observation, to supply a satisfactory sample, needs to be about twenty minutes long. Several observations totaling about three hours give a satisfactory basis for the first interpretations.[12]

Value of Study

Emanating from the preceding information is a series of questions, such as: If different time parameters--lengths and numbers of observations--were used in each of the research studies reviewed, would the obtained results be the same or different? How long should observations be? How many observations are needed to produce consistent measures of verbal behavior patterns of teachers? Just what impact does time have on measured verbal

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[12]Edmund J. Amidon and Ned A. Flanders, The Role of the Teacher in the Classroom (Minneapolis, Minn.: Assn. for Productive Teaching, 1967) p. 94.

behavior patterns of teachers? The value of this study is in providing empirical data which will give at least partial answers to the questions that have been posed.

Statement of the Problem

The problem of this study was to ascertain the effects of two time parameters--number of observations and lengths of observations--on the stability of teachers' verbal behavior patterns measured by the Flanders System of Interaction Analysis.

The problem had two aspects. The first aspect of the problem was to determine how 10, 20, and 30 minutes of observation time affected the measured verbal behavior patterns of teachers. The second aspect of the problem was to determine the consistency between and among measured verbal behavior patterns of teachers obtained in two observations of 10, 20, and 30 minutes in length.

Hypotheses

In order to implement the problems in this study, the following hypotheses, which were formulated from the statement of the problem, were tested:

(1) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 20 minutes of the same observation.

(2) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 30 minutes of the same observation.

(3) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 30 minutes of the same observation.

(4) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 2 and the first 20 minutes of the same observation.

(5) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 2 and the first 30 minutes of the same observation.

(6) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 2 and the first 30 minutes of the same observation.

(7) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 10 minutes of Observation 2.

(8) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 20 minutes of Observation 2.

(9) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 30 minutes of Observation 2.

(10) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 10 minutes of Observation 2.

(11) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 20 minutes of Observation 2.

(12) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 30 minutes of Observation 2.

(13) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 10 minutes of Observation 2.

(14) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 20 minutes of Observation 2.

(15) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 30 minutes of Observation 2.

Procedure

Establishing Observer Reliability. Recommendations for the selection and training of the observer and the method of estimating observer reliability were followed.

Selection of Observer. Flanders recommends that an observer have experience as an elementary teacher[13] and experience as an observer of teacher classroom behavior.[14] Since the researcher for this project had had experience as an elementary teacher and as an observer of teacher behavior in many different kinds of classrooms both as an elementary principal and a supervisor of student teachers, he functioned as the observer for this project.

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[13]Ned A. Flanders, "The Problems of Observer Training and Reliability," Amidon and Hough, op. cit., p. 158.

[14]Amidon and Flanders, op. cit., p. 3.

Training of Observer. The observer had had much involvement in the FSIA training process. Initial training in the FSIA was received through the use of materials--manuals and audio tapes--prepared by the Association for Productive Teaching. Additional training experiences were provided through the observer's training of pre-service and in-service teachers in the FSIA.

Estimating Observer Reliability. A suggested Flanders' adaptation of Scott's coefficient was used to estimate the observer's reliability. A pre-project intra-observer reliability coefficient of .93 was established. A post-project check of observer reliability produced an intra-observer reliability coefficient of .92. (See Appendix B.)

Selection of Subjects. In order to control any unusual amount of institutional influence which might be present, a stratified random sampling process was used to select a proportionate number of intermediate teachers from each of the nine Norman, Oklahoma public elementary schools. Thirty elementary teachers in grades four, five, and six who had never had training in interaction analysis were randomly selected and observed. Since a sample of thirty teachers was selected from a population of sixty-seven, the proportion was a little less than 1 to 2. Therefore, in schools which had an even number of intermediate teachers, half of the teachers were randomly selected. In schools which had an odd number of intermediate teachers, one less than half of the teachers was selected. Art, Music, and Physical Education teachers were not selected in order to assure an opportunity to observe verbal interaction in a classroom.

Observing Procedure. Each teacher was observed for two thirty-minute periods on two different days with certain classroom controls

being exerted. The major classroom variables of time of day, class groups, content, and method were controlled by making both observations of each teacher at the same time on each day and involving the same group of students in the same content area. A method which involved the whole class and gave each member of the class an opportunity for verbal participation was selected by each teacher for the first observation, and was repeated during the second observation. Precise timing of observations and appropriate marking of the data gathered during each ten minute block of time of each observation were included in the observation procedure. The standard FSIA procedure of categorizing teacher-pupil interaction was followed.

Definitions

Direct Influence. Verbal behavior influence exerted by a teacher, who when measured by the FSIA, consistently uses a greater amount of direct statements than indirect. This influence minimizes the freedom of students to respond. Influence exerted by a teacher whose I/D ratios are consistently below 0.500.

Emotional Climate of Classroom. Generalized attitudes toward the teacher and the class that pupils share, despite their individual differences, growing out of social interaction between the teacher and pupils.

I/D Ratio. A measure of the FSIA which describes verbal behavior patterns of teachers. It is a ratio of indirect statements to direct statements. The ratio number is found by dividing the total number of matrix tallies in categories 1, 2, 3, and 4 by the number of matrix tallies in categories 1, 2, 3, 4, 5, 6, and 7. A ratio above 0.500 indicates indirectness, and a ratio below 0.500 indicates directness.

Indirect Influence. Verbal behavior influence exerted by a teacher, who when measured by the FSIA, consistently uses a greater amount of indirect statements than direct. This influence maximizes the freedom of students to respond. Influence exerted by a teacher whose I/D ratios are consistently above 0.500.

Interaction. Verbal communication taking place in a classroom. This might be teacher to student communication, student to teacher communication, or student to student communication.

Interaction Analysis. A classroom observational technique which allows the quantification with reliability of certain selected qualitative aspects of spontaneous verbal behavior of teachers and pupils.

Intra-Observer Reliability Coefficient. That coefficient which indicates the amount of agreement on the data collected by an observer during two observations of the same classroom situation.

Measured Verbal Behavior Patterns of Teachers. Those patterns which are described by the I/D ratios of the FSIA.

Observer. The researcher of this project who was trained in the use and interpretation of the FSIA, established himself as a reliable observer with a higher than .866 intra-observer reliability coefficient, and who observed and recorded the verbal behavior of teachers and students in classrooms.

Principal Behavior Pattern. That pattern of behavior of every teacher which sets the emotional climate of the classroom and appears to be rather stable once established. This pattern developed during the

first year of teaching is likely to be continued by a teacher the following year.[15]

Assumptions

(1) That the use of the FSIA provided reliable discrete observational data representative of the teachers' classroom verbal behavior.

(2) That a Scott's reliability coefficient based on intra-observer agreement of collected data constitutes observer reliability.

(3) That the verbal behavior of a teacher is an adequate sample of his total behavior.

(4) That the measured verbal behavior pattern (I/D ratio) reflects the principal verbal behavior pattern of a teacher.

(5) That the measured verbal behavior pattern (I/D ratio) reflects the principal behavior pattern of a teacher.

(6) That every teacher has a principal behavior pattern.

Delimitations

(1) The economics of time and money limited the amount of data that was collected.

(2) The generalizations drawn from this study are limited by the study to the study.

Overview of Subsequent Chapters

Chapter II will be a review of related research and literature. The treatment and analysis of data and findings will be presented in Chapter III. Chapter IV will include the summary, conclusions, and recommendations.

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[15] H. H. Anderson, "The Measurement of Domination and of Social Integrative Behavior in Teachers' Contacts with Children," Child Development, X (1939), 73-89, cited by Amidon and Flanders, op. cit., pp. 72-74.

CHAPTER II

RELATED LITERATURE

This review of related literature is concerned with the following:

(1) Research related to the development of the Flanders System of Interaction Analysis.

(2) Research related to the general uses of the Flanders System of Interation Analysis.

(3) Research related to the use of the Flanders System of Interaction Analysis in pre-service teacher education.

(4) Research designs which exerted various controls and used various time parameters--number and lengths--of observations when the Flanders System of Interaction Analysis was employed.

Historical Perspective

In 1936, Melby[16] suggested a need for reliable and valid techniques for measuring teacher-student interaction in the learning process.

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[16] E. O. Melby, "Supervision," Review of Educational Research, VI (June, 1936), 324-336, cited by John Withall and W. W. Lewis, "Social Interaction in the Classroom," Handbook of Research on Teaching, ed. N. L. Gage (Chicago: Rand-McNally and Co., 1963), p. 689.

One year before, Barr[17] concluded that "qualities, such as knowledge of subject and mastery of teaching skills, that are rapidly measured are overshadowed by the difficult-to-measure and subtle variables of the teacher's philosophy, personality, interpersonal relationships, and the area of teacher-pupil relationships."[18]

To some degree these opinions seemed to reflect a frustration which educational, clinical, and social psychologists experienced in the 1930's while attempting to measure social interaction in the classroom. For nearly two decades, opinionnaires, questionnaires, standardized achievement and intelligence tests, sociometric techniques, and ratings scales had been used in research for gathering information about how relationships between teachers and students affected the learning climate in classrooms.[19] More sophisticated instruments which could measure student-teacher interaction as it occurred were needed for use in the classroom.

As early as 1914, Horn[20] had developed a pupil response category system for supervisors to record pupil behaviors while observing

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[17]A. S. Barr, "The Measurement of Teaching Ability," Journal of Educational Research, XXVIII (April, 1935), 561-69, cited by John Withall and W. W. Lewis, "Social Interaction in the Classroom," Handbook of Research on Teaching, ed. N. L. Gage (Chicago: Rand-McNally and Co., 1963), p. 689.

[18]Withall and Lewis, op. cit., p. 689.

[19]Ibid., pp. 684-700.

[20]E. Horn, "Distribution of Opportunity for Participation Among the Various Pupils in Classroom Recitations," Teachers College Contr. Education, LXVII (1914), cited by Donald M. Medley and H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," Handbook of Research on Teaching, ed. N. L. Gage (Chicago: Rand-McNally and Co., 1963), p. 254.

in classrooms. In 1928, Puckett[21] improved the system by developing a set of symbols for each category which made recording easier. As a system for recording data it was effective, but it lacked the ingredient which makes an observation instrument complete--a means of scoring or quantifying the data for interpretation.

A detailed teacher-student response category system with a cumbersome recording process was designed by Wrightstone in 1934 for use in determining classroom interaction.[22] Wrightstone used the instrument for measuring purposes, but criticism was leveled at the validity and reliability of the measurements he obtained, mainly because of inadequate scoring procedures, but also because of the observer's inaccuracies in recording the data.

The response category systems developed by Horn, Puckett, and Wrightstone were rather ingenious systems.[23] Medley and Mitzel praised and noted the limitations of these observation instruments when they stated that "the quarter century since these procedures were introduced has seen little improvement in the forms of such items (categories of behavior). Improvements have been made, however, in procedures for

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[21]R. C. Puckett, "Making Supervision Objective," School Review, XXXVI (March, 1928), 209-212, cited by Donald M. Medley and H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," Handbook of Research on Teaching, ed. N. L. Gage (Chicago: Rand-McNally and Co., 1963), p. 254.

[22]J. W. Wrightstone, Appraisal of Newer Practices in Selected Public Schools (New York: Bureau of Publications, Teachers College, Columbia University, 1935), cited by Medley and Mitzel, op. cit., pp. 255-57.

[23]Medley and Mitzel, op. cit., pp. 254 and 256.

scoring them. A fresh look at classroom behavior with these old items and new methods of analysis might yield interesting results."[24]

In the late 1930's, Anderson began research in which he attempted to measure the emotional climate of the classroom.[25] By 1946, Anderson and his associates[26, 27, 28] had completed an extensive amount of research which became "the most powerful influence on the direction of the development of category systems which measure the affective climate of the classroom."[29]

Anderson et al were able to construct an observation system with categories of both verbal and nonverbal behavior for both teachers and students as they interacted with each other. The categories of behavior for teachers were divided into two major groups--dominant behavior and integrative behavior. Dominant behavior was that by which teachers controlled their students. Integrative behavior was that by which teachers encouraged various types of sharing. Later a procedure for recording

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[24] Ibid., p. 257.

[25] H. H. Anderson, op. cit., p. 73-89.

[26] H. H. Anderson and Helen M. Brewer, "Studies of Teachers' Classroom Personalities, I: Dominative and Socially Integrative Behavior of Kindergarten Teachers," Applied Psychology Monographs, No. 6, 1945.

[27] H. H. Anderson and J. E. Brewer, "Studies of Teachers' Classroom Personalities, II: Effects of Teachers' Dominative and Integrative Contacts on Children's Classroom Behavior," Applied Psychology Monographs, No. 8, 1946.

[28] H. H. Anderson, J. E. Brewer, and Mary F. Reed, "Studies of Teachers' Classroom Personalities, III: Follow-up Studies of the Effects Dominative and Integrative Contacts on Children's Behavior," Applied Psychology Monographs, No. 11, 1946.

[29] Simon and Boyer, op. cit., p. 3.

both teacher and student behaviors simultaneously was developed. Initially they used the system to observe children in nursery schools where they recorded the behaviors of one child at a time while interacting with the teacher. Each child was observed for five-minute periods twenty-four times (two hours). From this initial research, and reinforced by subsequent research, they concluded that the teacher was the most influential variable on the emotional climate of the classroom.

The research of Lippitt and White[30] also helped to give impetus to the study of classroom interaction by observational systems. In laboratory settings, they studied the influence which adults leaders had on groups of boys, and their findings supported the general conclusions of Anderson and his colleagues.

By 1949, Withall had developed a category system to measure classroom interaction by classifying teachers' statements.[31] However, it was not a technique for observing in the classroom, but a way of classifying typewritten transcripts which were taken from sound recordings of actual classroom sessions. This system was based on the assumption that a teacher's verbal behavior adequately represents his total behavior. Withall's system consisted of seven categories--three of which represented types of learner-centered statements, three of which represented types of teacher-centered statements, and one which represented

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[30]R. Lippitt and R. K. White, "The Social Climate of Children's Groups," Child Behavior and Development, eds. R. G. Barker, J. S. Kounin, and H. F. Wright (New York: McGraw-Hill Book Co., 1943).

[31]John Withall, "The Development of a Technique for the Measurement of Social-Emotional Climate in Classrooms," Journal of Experimental Education, XVII (March, 1949), 347-61.

neutrality. A ratio between the number of learner-centered statements and the number of teacher-centered statements of a teacher gave a quantified assessment of the emotional climate of the classroom. Withall referred to this ratio as the "Climate Index." In developing this system, Withall found that 200 statements would give an adequate sample of a given teacher's statements. Withall's research using this instrument also supported Anderson's conclusion that a teacher's behavior sets the emotional climate of the classroom.

Mitzel and Rabinowitz[32] seemed to be concerned with time parameters when they used Withall's technique. They visited four teachers--two fourth and two fifth grade teachers--eight times each on eight consecutive Monday mornings. Each observer tallied teachers statements for about thirty minutes on each visit. They found each teacher's behavior varied significantly from visit to visit, and they concluded that teachers adapt their behaviors to the immediate situation.

In 1950, Bales[33] developed a research technique to analyze small group behavior which he called "Interaction Process Analysis." Since the Interaction Process Analysis was an observational technique for recording interaction as it occurred, and had categories of behavior which described the behavior of teachers and students in the classroom, Bale's technique had a profound influence on the development of classroom interaction analysis systems.

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[32]H. E. Mitzel and W. Rabinowitz, "Assessing Social-Emotional Climate in the Classroom by Withall's Technique," Psychological Monographs, LXVII (1953), 1-19.

[33]Robert F. Bales, Interaction Process Analysis (Cambridge, Mass.: Addison-Wesley Press, Inc., 1950).

In the early 1950's, Flanders developed the interaction analysis system used in this study (See Appendix A). Flanders' research in the development of interaction analysis was actually an extension and refinement of the work of Anderson, Lippitt and White, Withall, and Bales. Flanders' categories of behavior are much like his colleagues, but he made two unique contributions to the development of interaction analysis. They are a procedure for recording spontaneous verbal behavior in the classroom and a method of preserving behavior sequences.

General Uses of the FSIA

In developing the Flanders system, Flanders first conducted research in laboratory situations in which he confronted individual students with various types of teacher behavior. He noted that direct, or dominant, teacher behavior was disliked by students, caused a reduction in retention of knowledge, and caused certain physical disorders of the students' bodies. Indirect, or integrative, teacher behavior produced the opposite student reactions. Hence, Flanders' initial laboratory work confirmed the findings of his predecessors, that the teacher's behavior is the primary factor in establishing the climate of a classroom.[34]

The early field studies between 1954-57 were designed to determine the effects of various types of teacher behavior on the attitudes of students. In Wellington, New Zealand, Flanders composed profiles of

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[34]Ned A. Flanders, "Person-Social Anxiety as a Factor in Experimental Learning Situations," Journal of Educational Research, XLV (October, 1951), 100-10.

teacher behavior from 70,000 tallies recorded during 200 observer hours in 33 classrooms. He found that in classes which had high attitude scores--where the students liked teachers, wanted to do school work, felt that rewards and punishment are fair, and felt independence from teachers--teachers utilized more indirect influence than teachers with classes which had lower attitude scores. Whereas, classes with low attitude scores had teachers who exerted more direct influence than teachers with classes which had higher attitude scores.[35]

Between 1958-60, Flanders and his associates[36] conducted a research study in the Minneapolis public schools. One part of the study was the following: Sixteen social studies and sixteen mathematics teachers were chosen from a large group of volunteer teachers to teach two-week units in their respective subject areas under controlled circumstances. Three trained observers worked together providing six hours of observations in each classroom. Some observations were for one hour and others were two hours in length. Composite matrices of direct and indirect teachers showed that the two groups were significantly different. They found that achievement was generally higher in classes where the teacher was indirect. However, they also found that some students learn more under direct teacher influence than under indirect influence.

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[35]Ned A. Flanders, "Teacher-Pupil Contacts and Mental Hygiene," Journal of Social Issues, XV (1959), 30-39.

[36]Ned A. Flanders, Teacher Influence, Pupil Attitudes, and Achievement, United States Department of Health, Education and Welfare, Office of Education, Cooperative Research Project, No. 397 (Minneapolis: University of Minnesota, 1960).

Probably the most significant finding of this study was that indirect teachers are more flexible than those who are direct.

Medley and Mitzel questioned the comparing of one teacher with another based on the over-all performances of all teachers as was done in the Minneapolis study. Since the various teachers compared were working in different types of situations, they said that "use of scores either for comparing different teachers or for studying differences in a single teacher's behavior in these different types of situations implies inferences about unobserved behaviors, particularly when behaviors are related to student achievement, attitudes, and the like."[37]

Nelson[38] found that indirect teacher influence was positively correlated with pupil achievement on written language tests. And direct teacher influence seemed to inhibit the development of students' written language skills.

Neiman[39] studied the influence of teachers' verbal behavior on the academic achievement of high school sophomores. He selected sixty-four teachers and their classes for his study. The teachers represented the academic areas of English, mathematics, social studies and science. Each teacher was given one day's training in the Flanders system and was

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[37]Medley and Mitzel, op. cit., pp. 273-274.

[38]Lois Nelson, "Teacher Leadership: An Empirical Approach to Analyzing Teacher Behavior in the Classroom," Classroom Interaction Newsletter, II (November, 1966), 31-2, cited by Amidon and Flanders, The Role of the Teacher in the Classroom (Minneapolis, Minn.: Association for Productive Teaching, 1967), p. 86.

[39]Albert M. Neiman, "Measuring and Evaluating Verbal Influence and Effectiveness in Secondary School Teaching," Dissertation Abstracts, XXVIII (December, 1967), 2038.

later visited by two observers on three different occasions--twice in the fall and once in the spring--to obtain verbal behavior pattern scores. Pre- and post-tests of the Iowa Tests of Educational Development were employed to appraise student growth. He found that the correlation of student achievement with their teachers' measured verbal behavior was not statistically significant.

A long-term study was conducted by Powell[40] to determine the effects of indirect or direct teacher influence patterns on pupil achievement. Pupils were assigned to a teacher for three years. During the third year data was collected through the FSIA. During the fourth year the students were assigned to new teachers and more data was collected through the FSIA. (The time parameters of observations were not mentioned in the abstract.) The students who spent three years with more indirect teachers scored higher on the SRA Achievement Tests than those students who were with more direct teachers. Powell concluded that indirect teaching facilitates pupil achievement.

Amidon and Flanders[41] exposed a selected group of 140 dependent-prone students in groups of twenty to teachers who role-played highly direct and highly indirect behavior. They found that geometry achievement was higher for those students who were exposed to indirect teacher influence.

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[40] Evan Rhys Powell, "Teacher Behavior and Pupil Achievement," Dissertation Abstracts, XXIX (October, 1968), 1135-6.

[41] Amidon and Flanders, "The Effects of Direct and Indirect Teacher Influence on Dependent-prone Students Learning Geometry," Journal of Educational Psychology, LII (1961), 286-91, cited by Amidon and Hough, op. cit., pp. 210-16.

Taking the results of observations from fifty-six elementary classrooms, grades three through six, Soars[42] selected sixteen classrooms to study the extreme effects of indirectness and directness on the development of vocabulary and reading skills. He found that indirect teaching behavior produced greater growth in vocabulary and reading skills than did direct teaching behavior.

Weber[43] discovered that indirect teaching produced higher scores on the Torrance Creativity Tests than did direct teaching. His conclusion was based on a study of students who had spent three years with either a direct or indirect teacher.

In two separate studies, La Shier[44] and Schantz[45] found that indirect teaching influence generally produced higher student achievement in science. Schantz noted that results were not significant for students with lower abilities.

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[42]Robert S. Soar, "Pupil Needs and Teacher-Pupil Relationships: Experiences Needed for Comprehending Reading," Amidon and Hough, op. cit., pp. 243-50.

[43]W. A. Weber, "Teacher and Pupil Creativity," Unpublished doctoral thesis, Temple University, Philadelphia, 1967, cited by Amidon and Flanders, op. cit., p. 87.

[44]W. S. La Shier, Jr., "The Use of Interaction Analysis in BSCS Laboratory Block Classrooms," Paper read at the National Science Teachers Association meetings, New York City, April 3, 1966, cited by Amidon and Flanders, The Role of the Teacher in the Classroom (Minneapolis, Minn.: Association for Productive Teaching, Inc., 1967), p. 86.

[45]Betty Schantz, "An Experimental Study Comparing the Effects of Recall by Children in Direct and Indirect Teaching Methods as a Tool of Measurement," Unpublished doctoral thesis, Pennsylvania State University, State College, 1963, cited by Amidon and Flanders, The Role of the Teacher in the Classroom (Minneapolis, Minn.: Association for Productive Teaching, Inc., 1967), p. 88.

Interaction analysis has been used in some in-service training programs for teachers. In 1962, a group of fifty-five teachers participated in a nine weeks in-service training program conducted by Flanders.[46] Each of those teachers who participated were observed about six hours before the training program began. Post training observations were made to determine the effect of the training on the teachers' behavior. The participants made changes in their patterns of spontaneous verbal behavior. They were able to change their patterns and exert various types of influence in different situations because of their awareness of the influence of their verbal behavior.

A two year in-service project was directed by Amidon, Kies, and Palisi[47] in which twenty-two teachers, a principal, and some specialists participated. The first year was spent in training the teachers in the use and interpretation of interaction analysis. The second year one-half of the teachers decided to use interaction analysis to analyze their teaching behaviors. Research was not conducted on this project; however, this project is illustrative of the type of in-service training programs being conducted using the Flanders system.

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[46] Ned A. Flanders, "Using Interaction Analysis in the In-service Training of Teachers," Journal of Experimental Education, XXX (June, 1962), 313-16.

[47] Edmund Amidon, Kathleen Kies, and Anthony T. Palisi, "Group Supervision: A technique for Improving Teaching Behavior," The National Elementary Principal, XLV (April, 1966), 54-8.

A study of the effects of training in interaction analysis on teachers' attitudes and verbal behavior was made by Wright.[48] Twenty-eight third, fourth, fifth, and sixth grade teachers served as the subjects for his research. Fourteen were trained in interaction analysis and fourteen were used as a control group. Each teacher was observed twice before and twice after receiving training in the FSIA. Those trained in the Flanders system had a greater change in overall verbal behavior and exerted much more indirect influence on students than those who did not receive the training. He further concluded that feedback through supervisors is more effective in producing change in teachers' verbal behavior than is having teachers self-analyze their verbal behavior through the use of audio tapes.

Pankratz[49] observed ten physics teachers during six class periods to determine their verbal behavior patterns. Of a group of thirty teachers these ten teachers were the five highest and five lowest ranking teachers based on evaluations of principals, students, and on the Teaching Situation Reaction Test completed by the teachers themselves. Teachers in the high sample were found to be more indirect--used more praise, less criticism and rejection, fewer commands, and were more accepting of students' ideas and feelings--than those teachers in the low sample.

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[48]Donald L. Wright, "A study of the Effect of Selected Types of Training and Feedback on the Verbal Behavior and Attitudes of Teachers," Dissertation Abstracts, XXVIII (June, 1968), 4866.

[49]Roger Pankratz, "Verbal Interaction Patterns in the Classrooms of Selected Physics Teachers," Amidon and Hough, op. cit., pp. 189-209.

In a research project by Emmer,[50] sixteen second grade teachers were observed for several periods by observers using the Flanders system to obtain teacher-pupil interaction patterns. From those observations baseline percentages of teacher and pupil verbal behavior were established. After obtaining the data the teachers were taught the differences between student response and initiation. The teachers were then asked to elicit increases in initiation during a forty-five minute period in which they were observed. Twelve of the sixteen teachers were given feedback about their interaction patterns and asked to elicit student initiation by using the students' ideas during a second forty-five minute period. The other four teachers did not receive feedback and were used as a control group. They too were observed a second forty-five minute period. Emmer's conclusion was that as teachers increasingly used students' ideas, student initiation was increased.

Pre-kindergarten teachers were used as Bauch's subjects for his research to determine how interaction analysis training affected the teachers' verbal behavior patterns.[51] He observed in each classroom two times and recorded three episodes (activities) each time. It is obvious that each episode was very short, and the total length of observation time was not given. The I/D ratios and the student talk to total amount of teacher talk ratios showed increases from the first observation to

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[50]Edmund Thomas Emmer, "The Effect of Teacher Use and Acceptance of Student Ideas on Student Verbal Initiation," Dissertation Abstracts, XXVIII (January, 1968), 2553-4.

[51]J. P. Bauch, "The Relationship Between Feedback from Observation and Teacher Verbal Behavior in Pre-Kindergarten Classrooms," Dissertation Abstracts, XXIX (September, 1968), 826-27.

the second observation. He concluded that the training in interaction analysis between the observations influenced the change.

Amidon and Giammatteo[52] compared superior teachers identified by administrators to randomly selected teachers called the average group. A total of 153 teachers were observed one time each for periods varied in length from thirty to forty-five minutes. They reported:

> . . . The superior teachers talked approximately 40% of their total class time, while the normative group talked approximately 52% of the time. The superior teachers were more accepting of student-initiated ideas, tended to encourage these ideas more, and also made more of an effort to build on these ideas than did the average group of teachers. The superior teachers dominated their classrooms less, used indirect verbal behavior more, and used direction-giving and criticism less than the normative group of teachers. The superior teachers asked questions which were broader in nature than the normative group, and their lectures were interrupted more by questions from the students. There was about 12% more student participation in the classes of the superior teachers.[53]

Robbins[54] learned that there was limited agreement between the principals' knowledge of the teachers' classroom behavior and the knowledge obtained by an observer using the Flanders system. However, there was a greater amount of agreement on those teachers who were most direct and indirect. He also found that the principals' years of experience in education and years of administrative experience related to the principals' knowledge of teacher behavior. Size of school, number of courses

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[52] Edmund Amidon and Michael Giammatteo, "The Verbal Behavior of Superior Elementary Teachers," Amidon and Hough, op. cit., pp. 186-88.

[53] Ibid., pp. 187-88.

[54] C. V. Robbins, "The Principal and His Knowledge of Teacher Behavior," Amidon and Hough, op. cit., pp. 176-85.

taken in supervision by the principals, type of degrees held by the principals, sex of principals, and the average number of years the principals had known the teachers were not significantly related to the principals' knowledge of teachers' classroom behavior. The observer observed seventy-two teachers twice each for periods of forty-five to sixty minutes to obtain data from which the preceding conclusions were drawn.

FSIA and Pre-Service Teacher Education

A small but increasing quantity of information has been generated during the last quinquennium pertaining to the use of interaction analysis in pre-service education. Many colleges and universities have been using interaction analysis training with both graduate and undergraduate students,[55, 56] and research has been conducted to determine the effects of that training on pre-service teachers.

In 1964, Hough and Amidon[57] concluded the first study in which interaction analysis was used as a training device for pre-service teachers. They used measures obtained from the Teacher Situation Reaction Test (TSRT), Form E of the Dogmatism Scale, TSRT Observation Scale, and the General Supervisory Rating Scale to compare two groups of twenty teachers--one of which had received training in the Flanders system. Although the study design was limited due to certain uncontrolled variables,

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[55] Amidon, op. cit., p. 87.

[56] Edmund Amidon and Anita Simon, "Implications for Teacher Education of Interaction Analysis Research in Student Teaching," Research in Education, III (January, 1968), 74.

[57] John Hough and Edmund Amidon, "Behavioral Change in Student Teachers," Amidon and Hough, op. cit., pp. 307-14.

they concluded that student teachers with training in the Flanders system showed significant positive changes in attitudes and understandings which are associated with effective teaching, while those student teachers without such training showed no significant change.

Zahn[58] also used a series of measurements to test the effects of interaction analysis training on student teachers. His conclusions supported Hough and Amidon's findings, but he also found that interaction analysis could be used as an effective technique in supervising student teachers.

Romoser[59] was interested in discovering if three class periods of instruction in the Flanders system would alter teacher education students' attitudes toward, and perceptions of, a model teacher. Through instruments which he developed, he obtained scores which indicated that the three hours of training did affect positive attitude changes, but did not affect those perceptions teacher education students had of a model teacher.

Hart[60] used Bills' Teacher Problems Q-Sort to measure the degree of change in the openness of elementary teacher education students who had training in the Flanders system. In comparing a controlled group with

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[58]Richard D. Zahn, "The Use of Interaction Analysis in Supervising Student Teachers," Amidon and Hough, op. cit., pp. 295-98.

[59]David Richard Charles Romoser, "Change in Attitude and Perception in Teacher Education Students Associated with Instruction in Interaction Analysis," Dissertation Abstracts, XXV (May, 1965), 5570-71.

[60]Mary Anderson Hart, "An Investigation of the Relationship Between the Study of Flanders' Interaction Analysis and Changes in the Openness of Elementary Teacher Education Students," Dissertation Abstracts, XXVIII (November, 1967), 1718-19.

the experimental group who received interaction analysis training, she found more openness in the experimental group, but that difference was not large enough to be statistically significant.

Senoff[61] established consistent time parameters for observations for his doctoral dissertation study. All of the eighteen student teachers were observed for thirty minutes on three different occasions while they were teaching science or social studies at either the fourth, fifth, or sixth grade level. His significant finding was that those student teachers trained in the Flamidon (Adaptation of the Flanders system) system encouraged more student initiated talk than those without the interaction analysis training. Minnesota Teacher Attitude Inventory scores reflected that no significant change in attitude resulted from the exposure to the Flamidon system.

Cockrum[62] focused his study on nineteen student teachers in a special program called INSITE, which involved student teachers in an acroclinical semester of work at the University of Indiana. He considered time parameters rather unimportant in his study for he stated, "The purpose of observing is to gain a pattern of interaction, and this can be obtained regardless of the length of the observation." Each teacher was observed three times during a six-week period of the semester, and each of the observations varied between fifteen and twenty-five minutes.

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[61] Gordon Senoff, "The Influence of Flamidon Interaction Analysis Instruction on Student Teachers' Prediction and Performance of Select Objectives," Dissertation Abstracts, XXIX (February, 1969), 2592-93.

[62] John Robert Cockrum, "A Study of Classroom Interaction Demonstrated by Student Teachers of the INSITE Project at Indiana University," Unpublished doctoral dissertation, Indiana University, 1967.

He concluded that the teachers became more indirect as they progressed through their student teaching experience.

The Flanders system was used by Ragsdale[63] to determine the classroom behavior changes of forty-nine student teachers during a ten-week student teaching period. Each of the forty-nine student teachers was observed twice during the first two weeks and twice during the last two weeks of the student teaching period. The data obtained indicated no significant change in the classroom behavior of the student teachers during the student teaching period.

Wieder[64] compared intern teachers and student teachers by comparing their classroom verbal interaction patterns measured by the Flanders system. Each of the teachers was observed once during the early stages of the pre-service teaching experience and once again after six weeks. The observations ranged between twenty-five and thirty-five minutes on each teacher, and all the observations were made during introductory lessons in social studies. He found that intern teachers lecture more than student teachers, while student teachers use more praise and ask more questions.

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[63]Elva Mae Ragsdale, "Attitude Changes of Elementary Student Teachers and the Changes in Their Classroom Behavior During Student Teaching," Dissertation Abstracts, XXVIII (August, 1967), 521-22.

[64]Charles Franklin Wieder, "A Comparison of the Classroom Verbal Interaction Patterns of Intermediate Grade Student Teachers and Intermediate Grade Intern Teachers," Dissertation Abstracts, XXVIII (April, 1968), 4035-36.

Finske[65] also used the classic experimental technique of matching groups to determine if training in the Flanders system modified the flexibility of student teachers. Each student teacher was observed two times--once during the second week and again during the eighth week of student teaching. It was found that student teachers were more flexible, more indirect, influenced more pupil initiated talk, and were more aware of the influence of their verbal behavior on students after training in interaction analysis.

Simon[66] addressed her research to the question: Do student teachers trained in the Flanders system exhibit different teaching behavior in classes they view as favored and/or non-favored? Observations of each student teacher were made four times during the last weeks of the student teaching period--two each in favored and non-favored classes. She found that student teachers with interaction analysis training used more praise, less criticism, more indirect influence, and less direct influence in both favored and non-favored classes than those student teachers without such training.

Fourteen foreign language student teachers trained in the FSIA were shown to possess more positive attitudes toward student teaching, and their pupils were shown to possess more positive attitudes toward

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[65]Sister M. Joanice Finske, "The Effect of Feedback Through Interaction Analysis on the Development of Flexibility in Student Teachers," Dissertation Abstracts, XXVIII (December, 1967), 2117.

[66]Anita Simon, "The Effects of Training in Interaction Analysis on the Teaching Patterns of Student Teachers in Favored and Non-favored Classes," Dissertation Abstracts, XXVII (June, 1967), 4158-59.

the classroom behavior of the student teachers in a study by Moskowitz.[67] Pre- and post-Flanders matrices were built from audio tapes of four classes, and from this data it was suggested that this training produced more indirect teaching patterns.

Rebstock[68] reported that training in the Flanders system did not change certain values, attitudes, and personality traits of twenty-six student teachers at Texas Tech College. However, information produced from the Classroom Verbal Reaction Behavior Log (Modification of Flanders system) from three classroom observations of at least thirty minutes in duration indicated that the training produced more effective teaching behavior.

For Kirk's[69] research, thirty student teachers were observed on the average of about one hour and twenty-four minutes total time, or for four 21-minute periods. Two observations were made close to the beginning of their placement and two close to the end of their student teaching period. He found that student teachers who received training in interaction analysis talked less while their students talked more, and in general were more indirect than student teachers who did not receive such training.

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[67] Gertrude Moskowitz, "The Effect of Training Foreign Language Student Teachers in Interaction Analysis," Research in Education, II (December, 1967), 87.

[68] Charles W. Rebstock, "Changes in the Personality, Values, Attitudes, and Verbal Behavior of Student Teachers Through the Use of Certain Objective Observational Techniques," Dissertation Abstracts, XXVIII (June, 1968), 4939.

[69] Jeffrey Kirk, "Elementary School Student Teachers and Interaction Analysis," Amidon and Hough, op. cit., pp. 299-306.

Student teachers were used to observe student teachers in Ledbetter's study.[70] Student teachers were paired, and the two observed each other alternately. Each student teacher observed and was observed for four periods. Each period was not less than twenty minutes and no more than thirty minutes. He made an assumption that a twenty-minute observation would be an adequate sample of a fifty-minute class session. He concluded that feedback did not make the student teachers more indirect or less direct.

Summary

A review of the related literature and research pertaining to the Flanders System of Interaction Analysis reveals:

(1) That the Flanders system is a rather sophisticated interaction analysis instrument.

(2) That the Flanders system is an extension and refinement of the interaction analysis systems developed by Anderson, Withall, and Bales.

(3) That the Flanders system has been used rather widely as a research instrument.

(4) That teachers with indirect verbal behavior patterns, as measured by the Flanders system, positively affect students' attitudes, academic achievement, and creativity.

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[70] Howard Payne Ledbetter, "The Effects of Feedback From the Use of Interaction Analysis in Supervising Student Teachers," Unpublished doctoral dissertation, North Texas State University, 1967.

(5) That teachers trained with the Flanders system change their behaviors to those which are associated with effective teaching.

(6) That a wide range of controls and time parameters--number and lengths--of observations are used with the Flanders system, are not consistent within or between research studies, and are seemingly considered unimportant in their effects on the conclusions of these research studies.

CHAPTER III

TREATMENT AND ANALYSIS OF DATA

This chapter presents the analytical treatment of data obtained from the research instrument--the Flanders System of Interaction Analysis--used in this study. This chapter is presented in four sections as follows: (1) Statistical Analysis, (2) Analysis of Data, (3) Discussion of Findings, and (4) Summary.

Statistical Analysis

In order to implement the problems in this study, fifteen hypotheses were formulated from the statement of the problem. Two statistics--the Pearson product-moment correlation coefficient (r) and multiple correlation coefficient (R)--were selected to treat the data and test the hypotheses.

The Pearson product-moment correlation coefficient formula was used to test the fifteen hypotheses which were prepared in null form.[71] The derived scores had a potential range of +1.00 to -1.00 for a coefficient. Table values were used to indicate if the obtained coefficients were significant at the .05 and .01 levels of confidence. With n=30,

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[71]N. M. Downie and R. W. Heath, Basic Statistical Methods (New York: Harper and Row, Publishers, 1965), pp. 78-86.

df=28, the table values of the correlation coefficients are .3610 at the .05 level and .4630 at the .01 level of significance.[72]

A multiple correlation coefficient was obtained through the use of the multiple regression equation to give added predictive value among the correlations.[73] An F score was then derived from the obtained coefficient. Table values were used to indicate if the obtained F score was significant at the .05 and .01 levels of confidence. With df= 27/29, the table values for the F score are 1.87 at the .05 level and 2.45 at the .01 level of significance.[74]

Analysis of Data

Each of the fifteen hypotheses is restated with the obtained coefficient, significance of the coefficient, and treatment of the hypothesis. The analysis of the obtained multiple correlation coefficient will follow.

(1) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 20 minutes of the same observation. The computed value was found to be +.9598, which exceeds the table value at the .01 level of

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[72]R. A. Fisher and F. Yates, Statistical Tables for Biological, Agricultural, and Medical Research (Edinburgh: Oliver & Boyd, Ltd.), reprinted by George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Co., 1966), p. 413.

[73]Helen M. Walker and Joseph Lev, Statistical Inference (New York: Henry Holt and Co., 1953), pp. 318-26.

[74]G. W. Snedecor, Statistical Methods (Ames, Ia.: Iowa State College Press, Inc.), reprinted by Helen M. Walker and Joseph Lev, Statistical Inference (New York: Henry Holt and Co., 1953), pp. 466-9.

significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(2) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 30 minutes of the same observation. The computed value was found to be +.8170, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(3) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 30 minutes of the same observation. The computed value was found to be +.9578, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(4) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 2 and the first 20 minutes of the same observation. The computed value was found to be +.9369, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(5) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 2 and

the first 30 minutes of the same observation. The computed value was found to be +.8574, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(6) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 2 and the first 30 minutes of the same observation. The computed value was found to be +.9597, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(7) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 10 minutes of Observation 2. The computed value was found to be +.7817, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(8) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and the first 20 minutes of Observation 2. The computed value was found to be +.5931, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(9) There is no statistically significant correlation between the I/D ratios obtained during the first 10 minutes of Observation 1 and

the first 30 minutes of Observation 2. The computed value was found to be +.6422, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(10) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 10 minutes of Observation 2. The computed value was found to be +.7178, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(11) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 20 minutes of Observation 2. The computed value was found to be +.7056, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(12) There is no statistically significant correlation between the I/D ratios obtained during the first 20 minutes of Observation 1 and the first 30 minutes of Observation 2. The computed value was found to be +.6904, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(13) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 10 minutes of Observation 2. The computed value was found to

be +.7522, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(14) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 20 minutes of Observation 2. The computed value was found to be +.7419, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

(15) There is no statistically significant correlation between the I/D ratios obtained during the first 30 minutes of Observation 1 and the first 30 minutes of Observation 2. The computed value was found to be +.7315, which exceeds the table value at the .01 level of significance. Therefore, the null hypothesis was rejected and the alternative hypothesis of significant correlation was accepted at the .01 level of significance.

The multiple correlation coefficient was obtained by using the two lowest correlations among the fifteen correlations to predict the significance of the third lowest correlation. The computed value of the multiple correlation (R) was found to be +.9639. The F score derived from the obtained coefficient was 17.71. The computed value exceeds the table value at the .01 level of significance. Therefore, the two lowest correlations predict the significance of the third lowest correlation and the subsequent correlations of higher values.

Discussion of Findings

All of the fifteen null hypotheses were rejected at the .01 level of significance. Therefore, the alternative hypotheses of significant correlation were accepted for all. All of the coefficients showed the correlations to be positive or direct.

The correlation coefficients within both Observation 1 and Observation 2 are higher than any of the correlation coefficients between Observation 1 and Observation 2. The lowest correlation coefficient within an observation is +.8170 in Observation 1, and the highest correlation coefficient between observations is +.7522. This shows that there is more variance between observations than within observations. However, the variance is not statistically significant, and the correlations both within and between observations are highly significant.

The correlation coefficients between the I/D ratios of the first 10 minutes and 30 minutes within both Observation 1 and Observation 2 are lower than the correlation coefficients between the I/D ratios of the first 10 and 20 minutes and the first 20 and 30 minutes within both Observation 1 and Observation 2. This shows that there is more variance between the I/D ratios obtained in observation periods which varied 20 minutes in length than those obtained in observation periods which varied only 10 minutes in length. However, the variance is not statistically significant, and all of the correlation coefficients within both Observation 1 and Observation 2 are significant. A trend was established in both observations which indicates that the longer the observation the more variance between the I/D ratios.

The lowest correlation coefficients obtained were between the I/D ratios of the first 10 minutes of Observation 1 and the first 20 minutes of Observation 2, and the first 10 minutes of Observation 1 and the 30 minutes of Observation 2. The highest correlation coefficients obtained were between the I/D ratios of the 30 minutes of Observation 1 and the first 10 minutes of Observation 2, and the 30 minutes of Observation 1 and the first 20 minutes of Observation 2. This shows that the first 10 minutes of Observation 1 and the last 20 minutes of Observation 2 affected the variance more than the other blocks of time. It is indicative that various 10 minute blocks of observation time do affect the variance in the I/D ratios, but not significantly.

Since prediction can become more accurate if the predictors are increased, two correlations were used in significantly predicting a third correlation. The two correlations used were the lowest correlations among the fifteen and predicted the significance of the third lowest correlation. Therefore, they would predict the significance of the higher correlations.

Summary of Findings

The following findings indicate the effects time parameters have on the measurement of teachers' verbal behavior patterns using the Flanders system. These findings are based on data which were obtained through observations from classrooms in which controls were exerted on the major classroom variables of time of day, class groups, content, and method.

(1) All of the correlation coefficients are highly significant and direct. This indicates that time had little effect on the I/D ratios

obtained during the 10, 20, and 30 minutes of the two 30 minute observations.

(2) The correlation coefficients obtained within each observation are greater than those obtained between observations, but not significantly. This indicates that I/D ratios vary more between than within observations.

(3) Lengths of observations and various 10 minute blocks of time affected the I/D ratios, but not significantly.

(4) Both the single and multiple correlation coefficients indicated that each correlation is an adequate predictor of every other correlation. This indicates that I/D ratios obtained in ten minutes of observation time is as valid as I/D ratios obtained in 30 minutes of an observation, or in two 30 minute observations.

TABLE 1.--A summary analysis of correlation coefficients between the I/D ratios of 10 and 20 minute, 10 and 30 minute, and 20 and 30 minute observations within Observation 1 and Observation 2.

Source of Correlation Coefficients	Observation 1 r	Observation 2 r
10 and 20 minute observations	+.9598	+.9369
10 and 30 minute observations	+.8170	+.8574
20 and 30 minute observations	+.9578	+.9597

All computed values are significant at the .01 level, table value .4630.

TABLE 2.--A summary analysis of correlation coefficients between the I/D ratios of 10, 20, and 30 minute observations between Observation 1 and Observation 2.

Source of Correlation Coefficients		Observation 2		
		10 Min. Obs.	20 Min. Obs.	30 Min. Obs.
Observation 1	10 Min. Obs.	+ .7817	+ .5931	+.6422
	20 Min. Obs.	+ .7178	+ .7056	+.6904
	30 Min. Obs.	+ .7522	+ .7419	+.7315

All computed values are significant at the .01 level, table value .4630.

CHAPTER IV

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND OBSERVATIONS

Problem

The problem of this study was to determine the effects of two time parameters--number and lengths of observations--on the measurement of teachers' verbal behavior patterns using the Flanders System of Interaction Analysis. Specifically, the problem was to determine how 10, 20, and 30 minutes of observation time affected the measured verbal behavior patterns of teachers, and to determine the consistency between and among measured verbal behavior patterns of teachers obtained in two observations of 10, 20, and 30 minutes in length.

Procedure

Thirty intermediate teachers in the Norman, Oklahoma public schools who had never received interaction analysis training were randomly selected and observed on two different days for two 30 minute periods by a reliable observer using the Flanders System of Interaction Analysis. The major classroom variables of time of day, class groups, content, and method were controlled by making both observations of each teacher at the same time on each day and involving the same group of students in the same content area while utilizing the same method.

The data gathered during each ten minute block of time of each observation was appropriately marked, and I/D ratios were calculated for the first 10 minutes, 20 minutes, and 30 minutes for both Observation 1 and Observation 2 for each teacher.

The Pearson product-moment correlation was used to determine the relationships between the various I/D ratios within and between Observations 1 and 2. To give added predictive value to the various correlations, a multiple correlation coefficient was obtained.

Conclusions

The data gathered in this study, and limited by the classroom controls established for this study, indicate that when the Flanders System of Interaction Analysis is used:

(1) Time parameters--number and lengths of observations--do not significantly affect I/D ratios.

(2) One observation significantly predicts the information about teacher directness and indirectness which can be obtained in two observations.

(3) A 10 minute observation significantly predicts the information about teacher directness and indirectness which can be obtained in 20 and/or 30 minutes of observation time.

Recommendations

Based on the results of this study, the following suggestions are made:

(1) That a replication of this study be conducted adding data from several more observations to determine if the correlations between and among observations remain significant.

(2) That basic duplications of this study be conducted, but varied by using the controls of this study--method, content, class groups, and time of day--as the parameters.

(3) That since in the review of the literature it was noted that many researchers did not give close attention to time parameters or controls, researchers should give strong consideration to the controls of their studies; for although time parameters--number and lengths of observations--did not affect the measurement of teachers' verbal behavior patterns under the controls imposed in this study, other conditions might significantly affect the measurement of teacher' verbal behavior patterns.

Observations Concerning the FSIA

(1) A vast amount of time is involved in becoming a reliable observer, making observations, recording data, and building and interpreting matrices. Due to the economics of time other means could be considered for teaching both pre-service and in-service teachers about their influence on students through verbal communication. Of course, other considerations would depend both on the purposes of and time available for training.

(2) Category 1 was used very little. Consideration could be given to merging it with Category 3. Many times a distinction cannot and should not be made between the two.

(3) Since teachers can be very direct through asking questions, consideration could be given to broadening Category 4 to include categories of questions which are both direct and indirect. Questions which exert direct influence could be considered under the broad classification of direct teacher influence. This would mean redefining "freedom to respond."

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APPENDIX A

Description of the Flanders System of Interaction Analysis[75]

Description of the Categories. The Flanders system consists of three major sections: (1) teacher talk; (2) student talk; (3) behavior which is neither teacher nor student talk--silence or confusion.

The first major section is subdivided into two classifications--direct teacher talk and indirect teacher talk. All teacher talk is classified as either indirect, or direct, depending on the amount of freedom the teacher gives the student to respond. Indirect teacher statements maximize the freedom of students to respond. Whereas, student responses are minimized by direct teacher statements.

In order to define teacher talk more precisely, the two classifications of indirect teacher talk and direct teacher talk are further subdivided into categories. Indirect teacher talk categories are: accepting feelings, praising or encouraging, accepting ideas, and asking questions. Lecturing, giving directions, and criticizing or justifying authority are the direct teacher talk categories.

The second major section is also subdivided into more meaningful categories. Student talk is either categorized as student initiated talk, or as a response solicited by the teacher.

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[75]Amidon and Flanders, op. cit., pp. 6-71.

TEACHER TALK INDIRECT INFLUENCE	1. ACCEPTS FEELING: Accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings is included. 2. PRAISES OR ENCOURAGES: Praises or encourages student action or behavior. Jokes that release tension, but not at the expense of another individual; nodding head, or saying "umhm" or "go on" are included. 3. ACCEPTS OR USES IDEAS OF STUDENT: Clarifying, building, or developing ideas suggested by a student. As teacher brings more of his own ideas into play, shift to category 5. 4. ASKS QUESTIONS: Asking a question about content or procedure with the intent that a student answer.
TEACHER TALK DIRECT INFLUENCE	5. LECTURING: Giving facts or opinions about content or procedures; expressing his own ideas, asking rhetorical questions. 6. GIVING DIRECTIONS: Directions, commands, or orders with which a student is expected to comply. 7. CRITICIZING OR JUSTIFYING AUTHORITY: Statements intended to change student behavior from nonacceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.
STUDENT TALK	8. STUDENT TALK - RESPONSE: Talk by students in response to teacher. Teacher initiates the contact or solicits student statement. 9. STUDENT TALK - INITIATION: Talk by students, which they initiate. If "calling on" student is only to indicate who may talk next, observer must decide whether student wanted to talk. If he did, use this category.
	10. SILENCE OR CONFUSION: Pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.

Fig. 1.--Categories for Interaction Analysis

Procedure for Categorizing Teacher-Pupil Interaction. A trained reliable observer enters a classroom and spends five to ten minutes getting oriented to the classroom before he begins to categorize. After the orientation period, the observer writes down a number of a category every three seconds of the interaction he has just observed. He records the numbers in sequence in a column at a steady tempo. When an observer completes his observation he will have several long columns of numbers.

Using and Interpreting the FSIA. The gathered data is used in an unique way. The sequence of recorded interaction is maintained by pairing the numbers thusly:

10
) 1st pair
6
2nd pair (
7
) 3rd pair
4
4th pair (
2

Each of these pairs is then recorded on a ten by ten matrix table. (See examples in Appendix D.) A tally is made in a cell in the matrix for each pair. The first number in a pair indicates the row and the second number indicates the column of the cell. Thus, our first pair (10-6) would be tallied in the cell formed by row 10 and column 6. Each pair would be treated in the same manner.

When the tallying is completed, the tallies in each category are totaled. From these totals one can describe interaction in terms of percentages, or various ratios, such as Indirect Teacher Talk to Direct Teacher Talk (I/D), Teacher Talk to Student Talk, etc.

APPENDIX B

Observer Reliability Data

The adapted Scott's coefficient used to establish intra-observer reliability for this study is called "pi." The adapted formulae are as follows:[76]

$$\pi = \frac{P_o - P_e}{100 - P_e}$$

where P_o is the percentage of agreement between two observers and is determined by subtracting the total per cent disagreement from 100.

where P_e is the percentage of agreement expected by chance and is found by squaring the percentages of tallies in each category and summing these over all categories.

$$P_e = \sum_{i=1}^{k} Pi^2$$

where k represents the categories.

where Pi is the percentage of tallies in each category.

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[76]Flanders, "The Problems of Observer Training and Reliability," Amidon and Hough, op. cit., p. 161-66.

PRE-PROJECT INTRA-OBSERVER RELIABILITY DATA

Category	Observation A	Observation B	% A	% B	% Diff.	(Ave. %)^2
1	0	0	0.0	0.0	0.0	0.0
2	18	22	5.8	6.7	0.9	0.3906
3	4	4	1.3	1.2	0.1	0.0156
4	64	68	20.7	20.7	0.0	4.2849
5	114	116	36.9	35.4	1.5	13.0321
6	1	1	0.3	0.3	0.0	0.0009
7	1	1	0.3	0.3	0.0	0.0009
8	4	3	1.3	0.9	0.4	0.0121
9	64	73	20.7	22.2	1.5	4.5796
10	39	40	12.6	12.2	0.4	1.5376
Totals	309	328	99.9	99.9	4.8	23.8543

POST-PROJECT INTRA-OBSERVER RELIABILITY DATA

Category	Observation A	Observation B	% A	% B	% Diff.	(Ave. %)^2
1	0	0	0.0	0.0	0.0	0.000
2	29	30	8.2	9.1	0.9	9.739
3	0	0	0.0	0.0	0.0	0.000
4	82	81	23.4	24.5	1.1	5.760
5	109	98	31.2	29.6	1.6	9.241
6	5	2	1.4	0.6	0.8	0.010
7	6	8	1.7	2.4	0.7	0.040
8	76	73	21.7	22.0	0.3	4.752
9	18	18	5.2	5.4	0.2	0.281
10	25	21	7.2	6.4	0.8	0.462
Totals	350	331	100.0	100.0	6.4	21.285

APPENDIX C

A summary of I/D ratios obtained in 10, 20, and 30 minutes of Observations 1 and 2

Subjects	Observation 1			Observation 2		
	10 min.	20 min.	30 min.	10 min.	20 min.	30 min.
1	.735	.652	.616	.581	.627	.638
2	.831	.744	.687	.719	.660	.627
3	.646	.617	.561	.529	.495	.488
4	.482	.421	.470	.276	.401	.438
5	.231	.231	.262	.428	.450	.403
6	.349	.332	.319	.228	.295	.346
7	.544	.471	.413	.295	.360	.386
8	.525	.534	.549	.571	.584	.459
9	.728	.682	.722	.807	.830	.813
10	.283	.415	.427	.551	.442	.288
11	.593	.554	.503	.480	.340	.334
12	.636	.644	.625	.430	.524	.528
13	.853	.720	.689	.629	.718	.620
14	.535	.590	.579	.661	.678	.707
15	.414	.490	.446	.350	.311	.281
16	.442	.446	.423	.221	.324	.375
17	.578	.506	.400	.556	.562	.578
18	.494	.461	.520	.494	.415	.376
19	.590	.594	.625	.604	.454	.524
20	.405	.355	.331	.234	.278	.295
21	.582	.507	.448	.361	.338	.376
22	.582	.565	.503	.331	.323	.303
23	.298	.257	.180	.125	.116	.127
24	.634	.671	.683	.583	.470	.459
25	.446	.285	.269	.193	.226	.221
26	.608	.425	.359	.079	.105	.175
27	.618	.533	.567	.548	.601	.608
28	.489	.527	.566	.203	.259	.286
29	.198	.139	.128	.248	.311	.302
30	.652	.529	.495	.407	.417	.408

APPENDIX D

INTERACTION ANALYSIS MATRICES

Subject 1

I/D Ratio .735
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	4					
3										
4				16	4	1		47	4	8
5				14	17			1		2
6									1	
7										
8		15		21	6			24	3	6
9		3		4	2				9	
10		1		9	1			5	1	7
T		19		78	34	1		77	18	23

I/D Ratio .581
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	2		1			1
3			4	1						
4		1		11	4			35	3	7
5		1		16	26			2	2	5
6										
7				1						
8		6		13	17			21		4
9			1	2	1				5	2
10		1		12	3			3	1	18
T		9	5	61	53		1	61	11	37

I/D Ratio .652
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				22	9			1		
3				2	1				1	
4				23	5	1		71	15	12
5				26	48			2	5	4
6									1	
7					1					
8		23		30	12			34	5	9
9		8	4	11	6		1		41	1
10		1		13	3			7	3	12
T		32	4	127	85	1	1	115	71	38

I/D Ratio .627
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				13	5		1	1		1
3			5	1						1
4		2		26	6		2	92	5	16
5		1		33	47			3	5	9
6										
7				4	2		1			
8		15		46	32		1	26		9
9		2	2	2	2		1		17	2
10		1		24	4		1	8	1	30
T		21	7	149	98		7	130	28	68

I/D Ratio .616
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				25	12			1		
3			1	2	1				3	1
4				28	8	2		99	25	18
5				41	70			4	10	7
6				1		3		1	1	2
7					1					
8		27		49	22	1		45	5	12
9		10	7	16	12	1	1		81	2
10		1		18	6	1		12	3	20
T		38	8	180	132	8	1	162	128	62

I/D Ratio .638
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				15	5		1	1	1	1
3			5	1				1	1	1
4		2	1	46	7	1	2	133	16	20
5		1		48	62	1		3	9	9
6				2			1			
7				4	3	1	3			
8		16		69	43		1	33	2	15
9		3	3	12	7		2		36	5
10		2		29	6		1	8	5	36
T		24	9	226	133	3	11	179	70	87

INTERACTION ANALYSIS MATRICES

Subject 2

I/D Ratio .831
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	1	11	1					
3		2	3	8	3		1		5	1
4			1	18	1		1	10	23	2
5		2		6	6					1
6										
7							1		1	1
8		4		3	1			4	2	
9		5	17	8	3				64	1
10		1		2	1				3	
T		16	22	56	16		3	14	98	6

I/D Ratio .719
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		8	1			1	1	
3			1	2						
4				14	1			17	7	4
5		1		9	10			1	1	
6										
7								1		
8		7		5	5		1	34	3	3
9		3	2	5	3			2	41	1
10				1	2			2	4	
T		12	3	44	22		1	58	57	8

I/D Ratio .744
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	2	15	4				1	
3		7	12	14	4		1		6	1
4		1	2	24	3		1	15	39	3
5		2	1	15	27				4	1
6										
7				1			1		1	1
8		5		5	2			9	3	2
9		7	27	12	9		1		156	2
10		1		2	1			2	5	
T		25	44	88	50		4	26	215	10

I/D Ratio .660
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		14	3			1	1	
3		1	5	4	1				1	
4		1	1	20	4			30	17	6
5		1		19	28			1	6	
6										
7								1	1	
8		10	1	10	9		1	45	4	4
9		6	5	11	6		1	2	99	2
10				1	4			4	4	1
T		20	12	79	55		2	84	133	13

I/D Ratio .687
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	2	19	9				3	
3		7	14	18	7		1		6	1
4		1	2	27	6		2	38	48	5
5		3	1	28	48	1		1	6	1
6				1		1				
7				2	1		3		1	1
8		13		15	5		1	13	4	3
9		9	34	15	12		1		223	8
10		1		4	1			2	12	1
T		36	53	129	89	2	8	54	303	20

I/D Ratio .627
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		19	5	2		1	1	
3		1	5	5	1				1	
4		1	1	34	4	3		52	23	8
5		1		31	44			1	8	3
6					1	2	1	1		4
7								1	1	1
8		16	1	19	15	1	1	86	5	5
9		9	6	14	9		1	2	120	3
10				4	9	1		5	7	6
T		29	13	126	88	9	3	149	166	30

INTERACTION ANALYSIS MATRICES

Subject 3

I/D Ratio .646
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		10	11	1		1	1	
3			1		1					
4		1		25	3		1	33	8	3
5		1		19	27					2
6				1	1	3			1	
7		1						1		
8		13	1	18	3		1	3		
9		8		2	1	1			8	
10				1	2	1		1	1	1
T		26	2	76	49	6	2	39	19	6

I/D Ratio .529
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	10					
3										
4				21	3			19	7	6
5				18	53				1	
6										
7										
8		18		3	1			3		
9		6			2				10	
10				1	3			3		
T		24		57	72			25	18	6

I/D Ratio .617
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3		19	18	1		3	1	1
3			1		1					
4		1		45	11		1	56	8	11
5		2		33	60			5	1	4
6				1	1	3			1	
7		1						1		
8		31	1	28	7		1	7		3
9		8		3	2	1			8	
10				5	5	1		6	2	2
T		46	2	134	105	6	2	78	21	21

I/D Ratio .495
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				25	17	1				
3										
4				33	7	1		49	8	7
5				32	103	1		1	1	1
6				2	1	8				
7										
8		36		11	6			6	1	
9		7			3				10	
10				2	3			4		1
T		43		105	140	11		60	20	9

I/D Ratio .561
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3		25	27	1		8	1	1
3			1		1					
4		2		62	15		2	79	8	18
5		3		48	118			9	1	7
6				1	1	3			1	
7		2						1		
8		48	1	34	16		1	14		4
9		8		3	2	1			8	
10				11	8	1		7	2	3
T		66	2	184	188	6	3		21	33

I/D Ratio .488
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				34	26	1		2	1	
3										
4				48	9	2		75	10	11
5				51	159	1		2	1	1
6				2	1	8		1		
7										
8		56		17	12			14	1	
9		8			6				23	
10		7		3	4			6		1
T		64		155	217	12		100	36	13

INTERACTION ANALYSIS MATRICES

Subject 4

I/D Ratio .482
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			2	3	2				3	1
3				2						1
4				8	2	1			17	
5				5	29	1		2		
6				1	3					
7										
8				2				40		
9		8	1	5	4	1			29	1
10				3						
T		8	3	29	40	3		42	49	3

I/D Ratio .276
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	4	2			1	
3										
4				2		1		6	7	
5				5	47	1		1	3	1
6				2	1	2		2	1	2
7										
8		3		4				62	1	
9		6		2	4	2			10	2
10					2	2			2	1
T		9		17	58	10		71	25	6

I/D Ratio .421
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1	2	5	3	4			4	1
3				2						1
4				13	2	2		1	32	1
5				12	34	3		4	1	1
6				1	7	22	3			4
7						2	1	1		
8		2		2	2			105		
9		14	1	13	8	1			43	2
10				4	2	3			2	12
T		17	3	52	58	37	4	111	82	22

I/D Ratio .401
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3		10	4	2			2	
3				1						
4				3		3		13	19	
5				5	48	2		1	3	1
6		1		4	2	8		2	5	5
7							1	1	1	1
8		6		8			1	182	1	
9		11	1	6	4	9	1		11	2
10				2	2	3	1		2	3
T		21	1	39	60	27	4	199	44	12

I/D Ratio .470
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3	2	12	10	5		3	13	2
3				2						1
4				17	5	4	2	7	42	5
5		1		17	52	6		7	6	1
6				2	7	27	4	5	1	4
7				1		3	2	2	2	
8		8		10	5			125	1	1
9		36	1	18	11	1	1		51	4
10				4	2	3	1	1	7	12
T		48	3	83	92	49	10	150	123	30

I/D Ratio .438
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		5		12	5	4			6	1
3				1						
4				8	2	7	1	16	28	3
5		2		7	50	4	1	1	5	1
6		1		7	4	13	1	3	8	0
7				1	1		5	3	2	1
8		6		9		2	3	232	3	
9		18	1	19	6	11	2		23	5
10		2		3	3	5	1	1	6	7
T		34	1	67	71	46	14	256	81	27

INTERACTION ANALYSIS MATRICES

Subject 5

I/D Ratio .231
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				1			1		1	
3										
4				3	2	2	1		10	4
5				4	22	7				5
6				5	4	12	2		2	6
7					2		4			8
8										
9		3		4	3	4	3		1	1
10				5	5	6	3		5	39
T		3		22	38	31	14		19	63

I/D Ratio .428
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	2				1	
3										
4		1		4	2	1		15	9	1
5		1		5	9	4	3		5	4
6				4	3	2			1	9
7				2	1				1	1
8		4		4	2	4				2
9		1		5	5	1			1	5
10				6	7	8	2	1		36
T		8		34	31	20	5	16	18	58

I/D Ratio .231
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				1	3	1	1		1	3
3										
4				4	6	2	2		14	5
5				4	38	12			11	11
6				5	5	14	2		3	11
7				1	2		7		1	10
8										
9		9		9	13	4	3		5	5
10		1		8	12	7	6		15	108
T		10		32	79	40	21		50	153

I/D Ratio .450
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		6		11	3	1			1	4
3										
4		3		10	7	3	1	28	12	9
5		5		9	33	8	3	2	7	12
6		1		6	4	6			4	12
7				2	1				1	2
8		8		11	5	5		1		2
9		3		9	10	1			1	6
10		1		14	16	12	2	1	4	51
T		27		72	79	36	6	32	30	98

I/D Ratio .262
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	7	2	1		3	6
3										
4				4	9	3	3	5	19	7
5		2		7	57	17	1		6	17
6		1		5	5	19	2		5	18
7		1		2	4		7		2	12
8		1			1	1	1			1
9		15		13	17	5	5		8	7
10		3		13	19	8	8		20	157
T		24		48	119	55	28	5	72	225

I/D Ratio .403
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		6		13	4	1			2	7
3										
4		3		10	8	4	1	41	16	11
5		5		16	60	10	3	3	9	24
6		1		9	6	10			4	17
7				2	1	1			1	2
8		14		13	9	6		1		5
9		3		10	23	2	1		3	10
10		2		20	20	16	2	2	16	84
T		34		93	131	50	7	47	51	160

INTERACTION ANALYSIS MATRICES

Subject 6

I/D Ratio .345
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	6	1		1	1	1
3										
4				3	5			26	2	3
5				18	75	1		5	2	
6					3	1		1		
7							1	1		
8		15		12	6	1	1	3		1
9				1	2	1			2	1
10				2	2			2	1	3
T		15		41	99	5	2	39	8	9

I/D Ratio .228
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	4				1	1
3										
4				3	2			18	1	2
5				10	94	1			3	3
6						1				1
7					1					
8		8		5	3			7	1	2
9				4	5		1		16	2
10				2	3			1	5	1
T		8		26	112	2	1	26	27	12

I/D Ratio .332
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				9	8	5		1	1	2
3										
4		2		5	5	1		38	3	5
5		1		23	109	5		8	4	2
6				1	5	4		1		10
7							1	1		
8		21		16	11	2	1	14		1
9		1		1	4	1			17	2
10		1		5	8	3		3	2	40
T		26	150	60		21	2	66	27	62

I/D Ratio .295
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		8	12	1			1	1
3										
4				4	3	1		43	10	8
5				26	147	6	1		11	5
6		1		1	2	10	1			9
7				1	2	1				
8		17		13	9			7	2	6
9		3		10	14	2	2		30	4
10		2		7	7	3		4	10	8
T		24		70	196	24	4	54	64	41

I/D Ratio .319
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				11	12	5		1	1	2
3										
4		2		8	7	2		55	11	7
5		1		39	177	7		9	6	4
6				1	6	4		2		14
7							1	1		
8		25		23	15	3	1	20		3
9		2		2	11	1			24	5
10		2		10	11	5		3	4	57
T		32		94	239	27	2	91	46	92

I/D Ratio .346
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		10	12	1			2	1
3										
4				10	5	2		64	27	13
5				37	176	7	1		13	6
6		1		4	2	13	1		2	11
7				2	3	1			1	
8		19		20	14	3	2	7	3	7
9		4		25	19	3	3		41	9
10		2		14	9	4		4	13	10
T		27		122	240	34	7	75	102	57

INTERACTION ANALYSIS MATRICES

Subject 7

I/D Ratio .544
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				12	5			1	2	
3			3		1				2	
4		1		8	4			35	4	2
5				17	47				2	
6										
7										
8		16	1	13	5			6		4
9		3	2	1	4				4	
10				3	1			3		1
T		20	6	54	67			45	14	7

I/D Ratio .295
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		3	5	1			1	
3										
4				10	1	1		9	6	
5		1		5	64	3			4	2
6				1	3	7			3	
7										
8		4		3	1	1				
9		5		5	4	1			30	
10					1				1	1
T		12		27	79	14		9	45	3

I/D Ratio .471
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	18	11			1	3	1
3			4	2	1				2	
4		1		16	5		1	56	11	7
5				26	121		1		5	1
6										
7				1			1		1	
8		26	1	25	5			8	1	4
9		8	3	4	10				16	
10				5	2			5	2	1
T		35	9	97	155		3	70	41	14

I/D Ratio .360
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		8		10	11	5			3	
3		1	1							
4				12	1	1		17	9	
5		2		6	74	9			7	4
6				1	3	12			18	
7						1	3			
8		9		3	2	1			1	1
9		15	1	8	10	4	1		140	4
10		2			1	1			5	3
T		37	2	40	102	34	4	17	185	12

I/D Ratio .413
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	20	17			1	4	1
3		1	11	2	1				3	
4		1		18	7		1	69	16	10
5				35	207		1		11	2
6										
7				1	1		2		1	
8		29	1	34	7			9	1	4
9		13	5	6	12		1		47	1
10				6	4			6	2	2
T		44	18	122	256		5	85	85	20

I/D Ratio .386
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		12		17	14	8			6	1
3		1	1							
4				16	1	1		30	14	
5		2		10	104	12			13	6
6				2	3	14			22	3
7						1	3			
8		16		5	4	2		4	1	2
9		25	1	11	16	5	1		212	7
10		2		1	4	1			10	10
T		58	2	62	146	44	4	34	278	29

INTERACTION ANALYSIS MATRICES

Subject 8

I/D Ratio .525
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	2			1	3	4
3					1					
4				6		1		29	3	5
5		1		5	37	1			3	5
6					2	1		1		
7										
8		14		13	4			4		6
9		1	1	3	2				7	5
10				12	4	1		6	3	1
T		16	1	45	52	4		41	19	26

I/D Ratio .571
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	4				1	
3			10	4	1				1	1
4		1		7				8	15	5
5		1		7	21			1	7	6
6										
7										
8		4		1	2			7		3
9		1	7	6	9				30	5
10		1		7	8			1	5	12
T		8	17	35	45			17	59	32

I/D Ratio .534
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				11	5	1		1	3	7
3					1					
4				10		1		51	7	10
5		1		12	40	4		5	3	7
6		1			2	3		10	1	5
7									1	
8		25		18	10	7		32		20
9		2	1	6	4		1		7	5
10				22	10	6		13	5	18
T		29	1	79	72	22	1	112	27	72

I/D Ratio .584
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	5				3	9
3			10	4	1				1	1
4		1		7				26	17	10
5		1		10	29	1		1	8	14
6						1			1	3
7										3
8		16		3	3			7		6
9		2	7	7	15	1			32	17
10		1		26	10	2	3	1	21	77
T		22	17	61	63	5	3	35	83	140

I/D Ratio .549
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				17	5	1		1	4	10
3		1	5		2				1	
4				15	1	1		59	15	18
5		1	1	15	55	4		5	8	14
6		1			2	3		10	1	5
7									1	1
8		28		20	13	7		38		21
9		7	2	9	9		1		11	12
10			1	32	16	6	1	14	11	67
T		38	9	108	103	22	2	127	52	148

I/D Ratio .459
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	7				3	9
3			10	4	2				1	1
4				8			1	30	37	11
5		1		25	72	2		1	12	23
6						5			1	7
7					2					3
8		17		3	3			7		9
9		3	8	11	33	1	1		39	21
10		1		33	15	6	3	1	26	123
T		24	18	88	134	14	5	39	119	207

INTERACTION ANALYSIS MATRICES

Subject 9

I/D Ratio .728
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	6					6
3				2						1
4				6				33	9	1
5				7	14	1			1	3
6										3
7										
8		23		4	1	2		4		4
9		3	3	3	2			1	16	1
10				13	3				3	25
T		26	3	49	26	3		38	29	44

I/D Ratio .682
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				18	7	2				7
3			1	5	1				1	1
4				10				51	20	2
5				13	24	1			1	7
6				1		2			2	4
7								1	2	1
8		28		7	6	2	1	25	2	8
9		6	7	12	3		1	1	50	9
10			1	18	5	2	2	1	10	34
T		34	9	84	46	9	4	79	88	73

I/D Ratio .722
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	25	8	2				8
3			1	12	1				2	1
4			1	21	2			64	31	7
5				16	26	3			3	7
6				2	1	2			3	5
7								1	2	1
8		32		11	6	3	1	31	3	12
9		12	12	20	4		1	1	121	16
10			1	20	7	3	2	2	21	36
T		44	16	127	55	13	4	99	186	93

I/D Ratio .807
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	1					
3			3	13	1				3	
4				10	3			11	36	5
5			2	4	10	1			2	
6				1						
7									1	
8		1		10						1
9		2	15	22	3		1		47	4
10				3	1			2	5	2
T		3	20	65	19	1	1	13	94	12

I/D Ratio .830
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	5	2					
3			7	20	1				3	
4				25	3			30	57	12
5			2	10	16	1			2	
6				2						
7									1	
8		4		23	2			18	1	3
9		4	21	33	5		1		97	7
10				9	2	1		3	8	4
T		8	31	127	31	2	1	51	169	26

I/D Ratio .813
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	9	2					1
3		2	7	24	1				4	
4				38	3			45	81	14
5			2	18	26	1			3	
6				2						
7									1	
8		4		32	6			21	2	4
9		7	28	44	9		1		176	13
10				13	3	1		3	12	7
T		13	38	180	50	2	1	69	279	39

INTERACTION ANALYSIS MATRICES

Subject 10

I/D Ratio .283
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4				2	2			7	10	
5				4	43				5	
6									1	
7										
8				2				1	2	4
9				10	6	1			70	7
10				3	1			1	8	1
T				21	52	1		9	96	12

I/D Ratio .551
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	1					
3										
4				2				11	5	1
5				4	18				3	
6									1	
7										
8		3		3	4			2		1
9		1		6	1	1			112	5
10					2				6	2
T		4		18	26	1		13	127	9

I/D Ratio .415
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2					1	
3										
4				9	3			13	20	1
5				7	49				9	
6						1			3	
7										
8		1		4		1		1	2	6
9		2		19	12	2			195	15
10				5	1			1	17	1
T		3		46	65	4		15	247	23

I/D Ratio .442
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	2					
3										
4				5	1			23	9	3
5				8	35		1		6	1
6									1	
7									1	
8		4		9	6			2	2	2
9		1		10	5	1			237	10
10				2	2				13	4
T		5		37	51	1	1	25	269	20

I/D Ratio .427
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4					2	
3										
4				14	5			23	27	3
5				15	62	1			16	1
6						1			4	1
7									1	
8		2		8	3	1		1	2	8
9		4		23	20	3	1		297	33
10				7	6			1	34	7
T		6		71	96	6	1	25	383	53

I/D Ratio .288
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	3					
3										
4				5	1			25	15	3
5				11	95		1		16	2
6									1	
7									1	
8		4		9	7			2	2	3
9		2		15	16	1			337	17
10				2	2				21	10
T		6		45	124	1	1	27	393	35

INTERACTION ANALYSIS MATRICES

Subject 11

I/D Ratio .593
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4	6				3	4
3										
4				17	4			25	11	2
5				18	27				1	5
6										
7										
8		10		7	8			4		
9		7		5	4				8	1
10				8	3				2	10
T		17		59	52			29	25	22

I/D Ratio .480
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		7	8					2
3				1						
4				8	1			29	1	2
5			1	9	44				5	3
6		1							1	
7										
8		12		12	5	1		7		2
9		3		2	2				14	
10		1		2	3	1		3		7
T		18	1	41	63	2		39	21	16

I/D Ratio .554
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				8	10				3	6
3										
4				31	8			64	17	2
5				31	68			6	4	8
6										
7				1						
8		19		25	14		1	5	2	9
9		8		7	10				9	2
10				17	7				4	16
T		27		120	117		1	75	39	43

I/D Ratio .340
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	1	7	10				1	3
3			1	2						
4				13	2		1	42	5	2
5			1	21	129				14	9
6		1							1	
7				1						
8		14		15	11	1		12		4
9		6		4	13				25	2
10		1		2	10	1		3	4	8
T		24	3	65	175	2	1	57	50	28

I/D Ratio .503
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				10	18			1	3	9
3		1								
4				39	11	7		84	17	5
5		2		47	108			6	8	15
6				2	2	2			2	5
7				1						
8		25		32	18	1	1	8	2	12
9		10	1	8	12				12	3
10		3		22	17	3			5	34
T		41	1	161	186	13	1	99	49	83

I/D Ratio .334
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3	1	10	13				1	4
3			1	2						
4				20	5		1	62	9	5
5		1	1	31	187	4			22	18
6		1			2				1	3
7				1						
8		18		23	16	2		13		6
9		8		5	24				28	5
10		1		10	18	1		3	9	14
T		32	3	102	265	7	1	78	70	55

INTERACTION ANALYSIS MATRICES

Subject 12

I/D Ratio .636
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				9	4				1	2
3		1		1	1					
4				10	3			52	2	5
5				14	19	2			4	5
6				1	2			2		1
7				1		1				
8		15		30	6	1		5	1	2
9			3	3	4				2	
10				3	5	2	2	1	2	12
T		16	3	72	44	6	2	60	12	27

I/D Ratio .430
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1				1						
2				4					3	2
3										1
4		1		3	1	2		9	10	3
5				10	22	1	1		4	2
6					1	2			2	2
7							2		2	2
8	1	3		2	1				1	1
9		5	1	5	10	1	3		26	17
10		1		3	5	1			21	10
T	1	10	1	28	40	7	6	9	69	40

I/D Ratio .644
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		14	7				1	10
3		1		1	1					
4		1		13	4	1		110	6	6
5		1		35	31	2			7	11
6		1		1	2			3		1
7				1		1				
8		19		57	24	2		7	1	10
9			3	4	10				6	2
10		9		15	9	2	2	1	3	43
T		84	3	141	88	8	2	121	24	83

I/D Ratio .524
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1				1						
2		1		11	1				5	4
3										
4		1		6	1	3		17	26	9
5				14	25	1	3		6	4
6				1	1	2			5	5
7				1		2	3		3	3
8	1	5		5	3				1	2
9		14	1	12	16	2	5		68	57
10		2		11	6	4	1		62	36
T	1	23	1	62	53	14	12	17	176	120

I/D Ratio .625
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		16	10				1	12
3		1		1	1					
4		1		18	4	1		148	7	11
5		3		42	48	3			13	19
6		1		1	2			3		2
7				1		1				1
8		22		81	30	2	1	8	3	14
9		1	3	6	20				11	6
10		10		24	13	2	2	3	11	77
T		41	3	190	128	9	3	162	46	142

I/D Ratio .528
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1				1						
2		2		11	2		1		6	6
3										
4		2		9	2	3	1	28	34	10
5				17	29	1	5		9	6
6				1	1	3			7	6
7				2		2	4		5	8
8	1	5		13	4				2	3
9		16	1	16	21	4	7		94	92
10		4		18	8	5	3		93	60
T	1	29	1	88	67	18	21	28	250	191

INTERACTION ANALYSIS MATRICES

Subject 13

I/D Ratio .853
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	3	1					
3			1	5	1				1	
4			1	2				19	17	11
5				3	3					3
6						1		1		
7										
8		2		13	2			11	1	5
9		2	5	14					45	4
10		1		11	2	1		4	5	11
T		5	8	51	9	2		35	69	34

I/D Ratio .629
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		7	2			3		1
3										
4		1		4	2			25		5
5				7	16			3		2
6					1					1
7										
8		11		14	4	1		55		7
9									1	
10		1		5	3	1		7	1	11
T		14		37	28	2		93	1	28

I/D Ratio .720
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	6	6				1	
3		2	5	6	1				1	
4		1	1	10	2	1	1	38	26	17
5		1		14	21				2	6
6						1		1	1	
7				1						1
8		5	1	21	7			22	3	9
9		3	7	19	2				74	9
10		2		20	5	1	1	8	6	22
T		14	15	97	44	3	2	69	114	64

I/D Ratio .718
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		8	2			6		3
3										
4		1		9	2			58		7
5				10	16			5	1	4
6					1					1
7				1						
8		17		39	8	1	1	141		15
9										1
10		1		10	6	1		12	1	22
T		20		77	35	2	1	222	2	53

I/D Ratio .689
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	7	12				2	
3		2	5	6	1				1	
4		1	1	12	3	3	1	50	39	24
5		1		24	33				4	7
6				2		2		1	1	
7				1						
8		8	1	28	8			28	4	10
9		7	7	31	6				149	17
10		3		23	6	1	1	9	15	23
T		22	15	134	69	6	2	88	215	87

I/D Ratio .620
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		8	2			6	1	4
3										
4		1		12	2			69		10
5		1		14	28			7	5	11
6					1	1		1		2
7				1						
8		18		42	12	2	1	198	2	19
9				2	9				8	1
10		1		15	11	2		13	5	89
T		22		94	65	5	1	294	21	136

INTERACTION ANALYSIS MATRICES

Subject 14

I/D Ratio .535
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		2	4				1	
3				3					2	
4				8	3			9	16	3
5				18	22				2	1
6						1			1	1
7										
8		2		2	4	1		4		2
9		5	6	3	7	1			69	1
10				2	3			2	1	3
T		9	6	38	43	3		15	92	11

I/D Ratio .661
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	4	2			1	
3										
4		1		9	2	1		31	6	7
5		2		16	13	2		2	1	
6					1					2
7										
8		14		13	10			15		2
9		4		3	2				16	
10				2	3			10	1	4
T		21		57	35	5		58	25	15

I/D Ratio .590
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3		11	6				2	
3				3					2	
4				11	6			40	25	8
5				29	37	2			4	1
6				1		4			1	3
7										
8		11		15	10	2		32	1	6
9		8	6	11	9	1		1	77	2
10				8	4			6	3	8
T		22	6	89	72	9		79	115	28

I/D Ratio .678
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		25	5	3			1	
3				1						
4		1		14	3	1		51	11	11
5		2		21	23	3		4	1	
6				2	1	1				2
7										
8		27		19	15			58	1	3
9		4	1	8	3				44	1
10				3	3			13	3	7
T		35	1	93	53	8		126	61	24

I/D Ratio .579
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		3		13	7				2	
3			1	3					3	
4				15	6			42	35	9
5				34	44	2			10	3
6				1		4			1	3
7										
8		11		16	10	2		32	1	7
9		11	7	16	21	1		1	210	20
10				8	4			6	24	8
T		25	8	106	92	9		81	286	50

I/D Ratio .707
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		33	6	3		1	2	
3			1	2						
4		1		25	5	1	1	62	30	13
5		2		27	27	3	1	4	3	1
6				2	1	1				2
7				1			1		1	1
8		32		25	16			74	1	3
9		10	2	20	8				107	5
10				4	3		1	13	8	7
T		47	3	139	66	8	4	154	152	32

INTERACTION ANALYSIS MATRICES

Subject 15

I/D Ratio .414
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	5			1		1
3			1	1						
4			1	3	1			17	1	3
5				11	27	1	1	6	2	2
6						3				3
7				1			1			
8		13		2	7			22	2	2
9				1	5					
10				1	5	2		3	1	39
T		13	2	26	50	6	2	49	6	50

I/D Ratio .350
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	1				1	1
3			1	1	2					
4				11	4			12	3	1
5				9	41	2		1	10	4
6						2				
7										
8		3		5	5			7		1
9		3	1	1	12				10	
10			1	2	4	1		1	1	44
T		6	3	31	69	5		21	26	53

I/D Ratio .490
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	7	4		2		1
3			1	1						
4			1	10	4			45	7	3
5		1		22	39	3	1	8	2	4
6				1		7		7	1	5
7				1			1			
8		28		10	17	5		63	2	3
9				5	8				6	
10				4	5	2		5	1	64
T		29	2	68	80	21	2	130	19	80

I/D Ratio .311
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	4				1	2
3			1	1	2					
4				12	5			33	4	8
5		1		24	104	6		2	14	7
6				1	1	6			1	4
7					2					1
8		9		11	14			26	1	6
9		4	1	4	16		1		12	1
10			1	3	11	1	2	6	5	62
T		14	3	62	159	13	3	67	38	91

I/D Ratio .446
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		16	7	6		2	1	5
3			2	1					2	
4		1	1	12	7			52	12	4
5		1		25	56	4	1	9	13	11
6				1		9		11	4	12
7				1			1			
8		33		16	19	5		80	2	4
9		1	2	10	25	5			9	3
10				5	7	8		7	11	114
T		37	5	87	121	37	2	161	54	153

I/D Ratio .281
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				10	4				1	2
3			1	1	2					1
4				14	5			55	7	8
5		1		28	185	10	1	4	17	10
6				1	3	8			2	6
7					3		2			2
8		13		24	19		1	29	1	7
9		4	2	7	22		1		18	4
10			1	4	14	2	2	6	11	106
T		18	4	89	257	20	7	94	57	146

INTERACTION ANALYSIS MATRICES

Subject 16

I/D Ratio .442
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				1	2					2
3									1	
4		1		10	2			10	9	4
5		1		4	26				11	11
6										
7										
8		1		4	5					
9		1	1	11	13				12	5
10		1		6	5				11	36
T		5	1	36	53			10	44	58

I/D Ratio .221
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										3
3										1
4		1		5	2			7	4	3
5				5	33	2			12	8
6		1				23			2	9
7										
8		1		2	2	1				1
9			1	6	16	2			5	4
10		1		4	7	7			12	30
T		4	1	22	60	35		7	35	59

I/D Ratio .446
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		2	3				2	7
3									1	
4		1		20	3			17	19	7
5		1		13	47	1			17	17
6						4			1	2
7										
8		2		4	8	1				2
9		5	1	15	26				29	14
10		5		13	9	1			22	80
T		15	1	67	96	7		17	91	129

I/D Ratio .324
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		2	2				1	6
3									1	1
4		1		18	4			13	17	6
5				10	61	3			21	21
6		1				23			2	10
7										
8		3		2	5	1				3
9		4	2	12	32	2			21	12
10		2		15	12	7		1	23	56
T		12	2	59	116	36		14	86	115

I/D Ratio .423
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		5	4				2	10
3									1	1
4		1		30	6			26	29	12
5		1		23	79	4			28	22
6		1				5			4	7
7										
8		2		5	10	2				7
9		10	2	21	41	3			42	24
10		6		20	17	3			37	121
T		22	2	104	157				143	204

I/D Ratio .375
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	3				2	9
3									1	1
4		1		27	5			25	33	12
5				21	87	4			28	28
6		1				23			3	11
7										
8		5		6	9	1		1		5
9		8	2	21	45	2			38	23
10		3		24	19	8		1	35	95
T		19	2	103	168	38		27	140	184

INTERACTION ANALYSIS MATRICES

Subject 17

I/D Ratio .578
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				17	7	1				
3						1				
4				13	3			32	2	5
5		1		15	27			5	6	1
6								3		1
7				1						
8		22		8	12	2		27		1
9		1	1		4				8	2
10		1		1	1		1	5	2	1
T		25	1	55	54	4	1	72	18	11

I/D Ratio .556
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		7	6					
3		1								
4				11	2			43	6	5
5				21	44					
6								1		
7										
8		11		19	10	1		12		8
9		2	1	3	4				5	
10		1		5				5	3	
T		17	1	66	66	1		61	14	13

I/D Ratio .506
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				21	17	1			2	
3				1		1				
4				21	4			74	4	8
5		2		32	90	1		6	10	4
6								3		3
7				1						
8		37		29	17	2		32		3
9		1	2	1	12				12	2
10		1		5	3	1	1	6	4	3
T		41	2	111	143	6	1	121	32	23

I/D Ratio .562
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	1	14	11				2	
3		1	6	4	1					1
4				19	3			55	23	8
5		2		29	74				6	6
6								1		
7										
8		14		21	14	1		12		11
9		10	6	10	13				20	6
10		2	1	10	1			5	13	23
T		31	14	107	117	1		73	64	55

I/D Ratio .400
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				23	17	1			2	
3				1		1				
4				25	5			95	5	10
5		2		42	172	4		6	13	7
6				1		15		3	1	8
7				1	1					
8		38		34	28	2	1	32		5
9		1	2	2	15	1			12	2
10		2		9	6	4	1	6	6	23
T		43	2	138	244	28	2	142	39	55

I/D Ratio .578
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		5	1	21	15	1			3	2
3		1	7	5	2					1
4				29	3			85	35	9
5		4		40	105				6	8
6								1		1
7										
8		21		37	19	1		21		16
9		16	8	16	17				30	9
10		2	1	12	2			8	21	37
T		49	17	160	163	2		115	95	83

INTERACTION ANALYSIS MATRICES

Subject 18

I/D Ratio .494
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	3					
3										
4				9	2	1		23		5
5				8	16			2	1	8
6					1	3				7
7										
8		5		14	6			8	1	5
9					3	1				1
10				7	4	6		7	3	64
T		5		40	35	11		40	5	90

I/D Ratio .494
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	1					1
3										
4				5	2			23		11
5				11	20	1		3	2	9
6					1					
7					1		1			
8		6		13	11		1	2		2
9		1			2					
10				7	8			8	1	63
T		7		41	46	1	2	36	3	86

I/D Ratio .461
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	10					
3										
4				15	2	1	1	54		15
5				28	54			8	4	13
6					1	3			1	7
7				1						
8		15		29	24			19	1	9
9				1	6	1				2
10				9	10	7		16	4	81
T		15		88	107	12	1	97	10	127

I/D Ratio .415
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	3					1
3										
4				6	2			70		18
5				37	77	4	2	8	2	11
6					3					1
7					3		1			
8		9		35	38		1	7		10
9		1			2					
10				12	13			16	1	71
T		10		96	141	4	4	101	3	112

I/D Ratio .520
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				12	13		1		1	
3										
4				21	4	1	1	91	2	29
5				36	75			13	4	19
6					1	3			1	7
7				2						
8		27		59	35			22	1	14
9				3	8	1				2
10				16	12	7		32	5	115
T		27		149	148	12	2	158	14	186

I/D Ratio .376
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	3					1
3										
4				28	5			104	1	24
5				59	150	5	2	9	4	13
6					5					1
7					3		1	1		
8		9		35	55		2	12		13
9		1			4				3	3
10				15	17	1		19	3	79
T		10		143	242	6	5	145	11	134

INTERACTION ANALYSIS MATRICES

Subject 19

I/D Ratio .590
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				11	8					1
3										
4		1		10	6			35	1	2
5				10	31			2		3
6								1		
7										
8		18		15	4	1		21		2
9		1							1	
10				3	2			3		11
T		20		55	51	1		62	2	19

I/D Ratio .604
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				7	5					
3		1								
4				5	1			42	1	16
5				20	27			1		2
6										
7										
8		11		25	17			10		
9			1							1
10				8	1			10	1	12
T		12	1	65	51			63	2	31

I/D Ratio .594
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				25	19			1		1
3										
4		1		25	6			69	1	15
5		1		31	70			3		5
6								1		
7										
8		43		27	11	1		32		3
9		1			1				1	
10				9	3			11	1	15
T		46		117	110	1		117	3	39

I/D Ratio .564
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				10	9					
3		1								
4				20	2			69	1	29
5				35	66			4		4
6										
7										
8		18		43	28			25		6
9			1							1
10				13	4			23	1	30
T		19	1	121	109			121	2	70

I/D Ratio .625
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				37	25			1		2
3										
4		1		37	7			106	2	28
5		2		42	89		1	4	1	7
6								1		
7				2						
8		61		42	19	1		54		8
9		1		3	1				1	
10				19	3		2	19	2	36
T		65		182	144	1	3	185	6	82

I/D Ratio .524
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				16	15					1
3		1								
4		1		28	4			98	1	42
5				49	124			7		7
6										
7										
8		30		52	37			39		12
9			1	1					1	2
10				28	8			26	1	43
T		32	1	174	188			170	3	107

INTERACTION ANALYSIS MATRICES

Subject 20

I/D Ratio .405
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1							1	
3										
4				6				14	7	1
5				2	15				14	13
6										
7										
8				5	2				3	4
9				7	21				24	11
10		1		8	6				14	31
T		2		28	44			14	63	60

I/D Ratio .234
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1			2				1	
3										
4				4	3			13	1	1
5				3	50	1	2		10	12
6						1				1
7					1		1			2
8		1		6	2				1	4
9		1		3	13				14	4
10		1		6	8		1	1	8	27
T		4		22	79	2	4	14	35	51

I/D Ratio .355
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1			1				1	1
3										
4				9	1			26	13	1
5		1		10	39				28	20
6										
7										
8		1		7	8				3	7
9				14	36				54	31
10		1		10	13				36	69
T		4		50	98			26	135	129

I/D Ratio .278
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		4		1	5				5	
3										
4				4	7			27	4	3
5		2		9	85	1	2	1	27	20
6						1				1
7					1		1			2
8		2		10	6				1	10
9		5		11	27				32	14
10		2		9	16		1	1	21	79
T		15		44	147	2	4	29	90	129

I/D Ratio .331
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1			1				1	2
3										
4				14	1			39	22	1
5		1		16	70	2			44	28
6						2			1	1
7										
8		1		12	13				3	10
9		1		23	55				87	38
10		1		12	21				46	102
T		5		77	161	4		39	204	182

I/D Ratio .295
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		6		2	5				8	
3										
4				4	10			51	7	3
5		2		16	115	2	2	2	41	31
6						2				2
7				1	1		3		1	2
8		6		18	11			1	5	14
9		5		19	45				56	25
10		2		13	25		3	1	33	101
T		21		73	212	4	8	55	151	178

INTERACTION ANALYSIS MATRICES

Subject 21

I/D Ratio .582
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	2			1		
3										
4				11	3			37		3
5				12	9			7	3	2
6										
7										
8		5		19	25			43	1	1
9		1		5	3				4	
10				4	1			7	5	8
T		6		54	43			95	13	14

I/D Ratio .361
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					2				1	1
3										
4				8	2			17	3	1
5				10	25	1	1	5	15	1
6					1					
7										1
8		3		5	11			16	2	1
9		1		5	14				55	5
10				3	3				5	1
T		4		31	58	1	1	38	81	11

I/D Ratio .507
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	3			1		1
3				1					2	
4				19	5			54	7	6
5				21	33		1	8	19	5
6										
7					1		1			
8		6		23	31			50	3	7
9		2	3	18	19				42	17
10				6	5			7	20	8
T		8	3	91	97		2	120	93	44

I/D Ratio .338
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					2				3	1
3										
4				13	2			33	13	2
5				26	61	1	1	7	29	2
6					1					
7										1
8		3		7	22			18	2	6
9		3		10	36				106	13
10				5	5			1	16	4
T		6		61	129	1	1	59	169	29

I/D Ratio .448
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4	5			1	1	1
3				1					3	1
4				25	7			62	11	8
5				28	68		1	10	34	7
6										
7					1		1			
8		7		26	34			57	3	12
9		5	5	22	32				101	33
10				7	11			9	37	12
T		12	5	113	158		2	139	190	74

I/D Ratio .376
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	4				3	2
3			1	2						
4				17	3			45	24	3
5			1	38	74	1	1	10	37	6
6					1					
7										1
8		8		10	26			35	4	9
9		3	1	15	52				156	28
10				6	10			3	31	10
T		11	3	90	170	1	1	93	255	59

INTERACTION ANALYSIS MATRICES

Subject 22

I/D Ratio .582
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2			1	3	5	2			2	
3				1	2					4
4				15	2		1	14	15	10
5			1	11	21	4		1	3	3
6				2	2	1				4
7					2					1
8		7		6	1					
9		5	5	9	4		1		4	3
10		2		10	5	2	1		6	6
T		14	7	57	44	9	3	15	39	31

I/D Ratio .331
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					5			1		
3										
4				8	2			26	4	1
5				11	57	6			4	2
6				5	2	7			2	2
7										
8		5		12	8	2		5		
9		2		3	3	1			10	1
10				2	2	2			1	6
T		7		41	79	18		32	21	12

I/D Ratio .565
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	1	14	13	2			2	4
3				1	2				1	4
4				24	3	2	1	49	17	13
5		1	1	22	46	5		1	8	8
6				5	2	5	1			7
7		1		1	2	1				1
8		24		18	3	1	1		2	
9		7	6	10	13	1	2		8	4
10		3		14	9	3	1		12	22
T		38	8	109	93	20	6	50	50	63

I/D Ratio .323
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	5			1	1	2
3										
4				11	2			46	7	2
5		1		19	104	6	1		6	7
6				5	3	8	1		2	3
7					1		1			1
8		6		18	13	3		6	1	9
9		5		9	7	2			22	2
10				4	7	3		3	9	46
T		12		68	142	22	3	56	48	72

I/D Ratio .503
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2	1	16	15	3			3	4
3				1	2				1	4
4				31	6	3	1	66	21	20
5		1	1	34	77	9		1	14	11
6				8	3	13	2		1	9
7		1		1	3	2	2		2	2
8		28		25	10	1	1	5	3	2
9		8	6	13	19	1	6		13	10
10		4		19	13	4	1	3	18	58
T		44	8	148	148	36	13	75	76	120

I/D Ratio .303
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	5			1	1	2
3										
4				12	5			64	9	2
5		1		27	124	9	3		15	13
6		1		7	6	11	1		5	6
7					2	2	6		2	3
8		6		23	16	5	1	9	2	15
9		5		14	21	4			29	4
10				6	10	6	4	3	15	86
T		13		92	189	37	15	77	78	131

INTERACTION ANALYSIS MATRICES

Subject 23

I/D Ratio .298
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										1
3										
4				7	2			12		2
5		1			10				10	8
6										
7					2		1			
8				3	6					3
9				5	13		2		38	28
10				1	4				38	27
T		1		16	37		3	12	86	69

I/D Ratio .125
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										1
3										
4					1			3	2	
5		1		1	25		2		8	9
6										
7									1	1
8					1				1	1
9				4	12				34	23
10				1	8				27	25
T		1		6	47		2	3	73	60

I/D Ratio .257
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1								2
3										
4				8	2			25	1	2
5		2		3	27	1	3		29	11
6					1	1				
7				3	3		2		2	2
8				5	9				1	10
9				8	33		4		76	53
10				4	8		4		65	50
T		3		31	83	2	13	25	174	130

I/D Ratio .116
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										1
3										
4				1	2			3	4	
5		1		3	80		2		41	22
6										
7									2	1
8					5		1	9	3	3
9				11	48				61	32
10				4	14				41	38
T		1		19	149		3	12	152	97

I/D Ratio .180
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1								2
3										
4				8	2			26	1	3
5		2		3	61	1	4		52	16
6					1	1				
7				3	3		2		4	3
8				5	10				1	10
9				10	56		5		129	77
10				4	13		4		90	76
T		3		33	146	2	15	26	277	187

I/D Ratio .127
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										1
3										
4				1	2			14	9	
5		1		6	125		3		70	33
6										
7				1	1		1		2	4
8				4	9		1	9	6	3
9				18	85		2		84	40
10				5	16		2		58	67
T		1		35	238		9		229	148

INTERACTION ANALYSIS MATRICES

Subject 24

I/D Ratio .634
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				10	9			2		1
3										
4				15	3			24		9
5		1		12	13	4		3	1	2
6						1		3		1
7				1						
8		21		6	5			55	1	2
9					2					
10				7	4		1	4		4
T		22		51	36	5	1	91	2	19

I/D Ratio .583
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				10	12					
3										
4				1	1	1	2	24		3
5		1		6				21	9	5
6					1					
7					3			2		
8		22		10	14		1	39	2	5
9				1	1		1			
10				4	1		1	7	1	1
T		23		32	33	1	5	93	12	14

I/D Ratio .671
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		26	16	1		2	1	1
3										
4				27	5	1	1	53		16
5		4		24	15	4	1	6	1	2
6						4		4		3
7				4				1		1
8		43		11	12		1	111	1	4
9				1	3					
10				10	6	1	3	7	1	20
T		48		103	57	11	6	184	4	47

I/D Ratio .470
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				14	13					
3										
4				3	2	2	2	38	2	4
5		1		9	24	1		29	12	10
6					3	2			2	1
7					3			2		
8		27		15	26	1	1	102	3	7
9				5	5		1		8	2
10				7	3	1	1	10	3	24
T		28		53	79	7	5	181	30	48

I/D Ratio .683
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		2		39	25	1		2	1	1
3										
4				40	9	1	1	81		26
5		5		36	22	5	1	12	1	5
6						4		4		4
7				4	1			1		1
8		64		21	15		1	144	1	11
9				1	3					
10				17	12	1	4	13	1	36
T		71		158	87	12	7	257	4	84

I/D Ratio .459
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				22	14				4	
3			2	1	1					
4				7	2	2	2	49	14	4
5		1		14	58	1	1	37	15	14
6					3	2			2	1
7				1	3			2		1
8		35		17	33	1	1	138	4	8
9		5	1	10	12		1		41	10
10			1	8	7	1	2	11	9	29
T		41	4	80	133	7	7	237	89	67

INTERACTION ANALYSIS MATRICES

Subject 25

I/D Ratio .446
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	4				1	4
3		1		1	1					1
4				9	4			21	8	6
5				15	65				1	1
6										
7										
8		12		2	5			8		4
9		2	4	1	1				4	6
10				14	3			3	4	6
T		15	4	48	83			32	18	28

I/D Ratio .193
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		4	5					
3										
4				7	1			12		5
5				8	133		1		1	1
6										
7					1		1			
8		9		5	1			11		
9					1					
10				1	2			4		
T		10		25	144		2	27	1	6

I/D Ratio .285
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				6	6				1	4
3		1	1	1	3					2
4				13	5		1	24	14	6
5				21	180				4	10
6							1			
7							1			2
8		13		3	7			12		4
9		3	7	3	4				10	8
10				16	12			4	6	12
T		17	8	63	217		3	40	35	48

I/D Ratio .226
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		5	5				3	
3					1					
4				12	2			32	1	6
5		1		17	173	1	1	1	17	12
6						4				2
7					1		1			1
8		11	1	9	12			13		5
9		2		6	21	1			18	3
10				3	8		1	5	12	11
T		15	1	52	223	6	3	51	51	40

I/D Ratio .269
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				8	7				2	5
3		1	1	1	3					2
4				13	5		1	34	20	8
5		1		25	227	1			16	27
6					1		1			
7							1			2
8		13		5	12			12	1	7
9		7	7	9	16				22	15
10				20	26			6	15	55
T		22	8	81	297	1	3	52	76	121

I/D Ratio .221
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		5	9				3	1
3					1					
4				12	2			49	4	6
5		1		24	230	1	1	2	35	23
6						4			1	2
7					1		1			1
8		13	1	13	16			14	1	12
9		5		13	45	1			31	7
10				5	13	1	1	5	26	33
T		20	1	72	317	7	3	70	101	85

INTERACTION ANALYSIS MATRICES

Subject 26

I/D Ratio .608
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	6			1	2	2
3		1	1						1	1
4				13	4			24	12	3
5				17	24		1	1	1	2
6										
7				1						
8		11		7	5			5		5
9		1	3	8	6				42	1
10				8	1			2	4	2
T		13	4	56	46		1	33	62	16

I/D Ratio .079
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					3					2
3										
4								5		
5		3		5	74	4	1		5	6
6					7		1		3	3
7					1	1	1		1	
8		1			1					3
9		1			13	2	1		5	1
10					4	2			9	38
T		5		5	103	9	4	5	23	53

I/D Ratio .425
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		5	11			3	2	2
3		1	1	1					1	1
4				17	5			39	14	4
5		1		24	77	3	5	1	4	7
6					2	6	1		2	5
7				1	3		1			2
8		20		10	8			12		8
9		1	4	11	11				53	1
10				10	5	8		3	5	19
T		24	5	79	122	17	7	58	81	49

I/D Ratio .105
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					3				1	2
3										
4				1				13	3	
5		3		7	99	9	1	1	26	18
6					8	4	1		5	8
7					1	1	1		1	
8		1		1	3	1		3	2	6
9		2		5	42	4	1		24	10
10				3	12	4			26	67
T		6		17	168	23	4	17	88	111

I/D Ratio .359
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		5	11			3	2	2
3		1	1	1					1	1
4				17	7			55	19	5
5		1		30	122	6	7	2	12	21
6					3	7	2		3	7
7				2	3		2		2	3
8		20		15	13			14		16
9		1	4	19	32				66	7
10				14	10	9	1	4	24	45
T		24	5	103	201	22	12	78	129	107

I/D Ratio .175
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					4				1	3
3										
4				3				27	15	2
5		3		11	132	10	2	1	33	29
6				1	8	5	1		6	10
7					1	1	2		2	1
8		3		9	5	1		3	2	8
9		2		14	60	6	1		63	20
10				9	15	4	1		44	88
T		8		47	225	27	7	31	166	161

INTERACTION ANALYSIS MATRICES

Subject 27

I/D Ratio .618
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				11	6					
3										
4				22	3			38		6
5				12	34			5		2
6										
7										
8		17		19	6			24		7
9				1						
10				4	4			7	1	2
T		17		69	53			74	1	17

I/D Ratio .548
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				9	3				1	
3					1					
4				10	4			33	7	5
5				17	33			2	5	2
6										
7										
8		11		12	12			17	1	3
9		2	1	7	5				5	1
10				4	2			4	2	8
T		13	1	59	60			56	21	19

I/D Ratio .533
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				15	16					1
3										
4				43	8			70		8
5		1		33	96			8	1	2
6										
7										
8		30		31	17			34		8
9		1		1					1	
10				6	4			9	1	4
T		32		129	141			121	3	23

I/D Ratio .601
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				21	8				2	1
3					11					
4				26	6			75	7	15
5				30	59			7	7	5
6										
7										
8		31		28	22			32	1	10
9		2	1	9	6				5	1
10				15	6			10	2	8
T		33	1	129	108			124	24	40

I/D Ratio .567
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		24	22					1
3										
4				72	16			111		19
5		1		56	137			11	1	4
6										
7										
8		45		52	27			43		13
9		1		1					1	
10				17	4			15	1	5
T		48		222	206			180	3	42

I/D Ratio .608
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				34	13				2	2
3					1					
4				49	8			117	7	22
5				41	97			9	9	8
6										
7										
8		48		45	28			40	1	17
9		2	1	10	8				8	2
10		1		24	9			13	4	12
T		51	1	203	164			179	31	63

INTERACTION ANALYSIS MATRICES

Subject 28

I/D Ratio .489
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2					3	
3										
4				6	1			22	11	
5				3	28				7	9
6										
7										
8				12	5			2		4
9		4		14	7				14	8
10		1		3	6				12	27
T		5		40	47			24	47	48

I/D Ratio .203
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					1				1	1
3										
4				1	1			10	5	2
5				4	58				13	10
6										1
7										
8				2	5					4
9		1		10	18				25	5
10		2		2	2	1		1	15	22
T		3		19	85	1		11	59	45

I/D Ratio .527
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	2				6	
3				1						
4				14	2			42	13	2
5				7	47				11	12
6										
7										
8		1		17	9			5	1	15
9		8	1	25	10				44	18
10		3		6	7			1	31	71
T		12	1	73	77			48	106	118

I/D Ratio .259
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				3	2				2	2
3										
4				5	2			23	9	4
5		1		4	88				25	22
6										1
7										
8		1		5	12			8	1	6
9		1		20	28				55	10
10		4		6	10	1		2	25	61
T		7		43	142	1		33	117	106

I/D Ratio .566
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	5				8	2
3				2						
4				24	4			64	23	4
5				12	62	1			16	16
6										1
7										
8		4		29	11			8	1	21
9		13	2	37	18				84	22
10		3		10	7			2	44	100
T		20	2	119	107	1		74	176	166

I/D Ratio .286
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4	2				2	4
3										
4				8	2			37	16	4
5		1		10	112			1	38	27
6										1
7										
8		2		12	18			13	1	8
9		3		25	45				94	24
10		4		8	12	1		2	43	86
T		10		67	191	1		53	194	154

INTERACTION ANALYSIS MATRICES

Subject 29

I/D Ratio .198
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2										1
3										
4				1				10	8	
5				3	45	1	1		11	15
6					1					
7				1					1	2
8				3	5					2
9				8	20		1		19	6
10		1		3	5		2		15	19
T		1		19	76	1	4	10	54	45

I/D Ratio .248
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2					3					1
3										
4				1	3			17		6
5				12	55	1	1	8	3	9
6									1	1
7					1			1		1
8		4		6	14		1	15		4
9				1	4	1	1		3	1
10				7	9			4	4	8
T		4		27	89	2	3	45	11	31

I/D Ratio .139
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				1	1					1
3										
4				1	1			14	8	
5				4	85	1	2	1	24	38
6					1					
7				1	1				3	4
8		1		3	9					2
9		1		11	39		3		23	44
10		1		3	19		4		63	57
T		3		24	156	1	9	15	121	146

I/D Ratio .311
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				2	11			1		4
3										
4				4	4		1	38	1	13
5		1		29	84	2	1	26	5	17
6									1	2
7					1		1	2		2
8		17		14	38		2	32		8
9				1	9	1	1		3	2
10				11	19			12	7	19
T		18		61	166	3	6	111	17	67

I/D Ratio .128
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2		1		1	3					1
3										
4				1	1			20	8	
5		1		7	119	1	5	1	38	53
6					1					
7				1	3		3		6	6
8		1		3	11		1			4
9		2		12	55		5		25	90
10		1		5	30		6		112	84
T		6		30	223	1	20	21	189	238

I/D Ratio .302
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4	14			1		4
3										
4				4	4		1	59	3	17
5		1		37	126	3	1	38	7	24
6				1	1	2			2	4
7					1		1	3		4
8		22		24	49		3	47		19
9				3	17	2	3		5	3
10				15	25	3		16	16	38
T		23		88	237	10	9	164	33	113

INTERACTION ANALYSIS MATRICES

Subject 30

I/D Ratio .652
Observation 1 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				9	5			2		1
3										
4				9	2		1	37		11
5				14	9				1	14
6							1			
7									1	1
8		16		16	3			3		6
9					6					
10		1		12	13	1		4	4	20
T		17		60	38	1	2	46	6	53

I/D Ratio .407
Observation 2 - 10 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				4	5				1	
3										
4				5	3			31		8
5		1		11	46				6	15
6						2				1
7										
8		7		14	7			3		3
9		1		3	6					1
10		1		10	13	1			3	17
T		10		47	80	3		34	10	45

I/D Ratio .529
Observation 1 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				5	8			2	2	3
3										
4				13	5		1	71	1	17
5				33	44	1	2		1	25
6						1	1			2
7					1		1		1	5
8		23		26	16	1	2	4		12
9				2	12				1	1
10		1		26	20	1	1	8	9	42
T		24		109	106	4	8	86	15	107

I/D Ratio .417
Observation 2 - 20 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				8	6				4	
3										
4				9	6			64		10
5		2		22	73			5	16	26
6						2				1
7										
8		14		26	22			7		8
9		1		7	16				2	7
10		1		17	23	1		1	10	31
T		18		89	146	3		77	32	83

I/D Ratio .495
Observation 1 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				13	9			2	2	3
3										
4				23	6		2	97	1	23
5				43	79	1	2	2	4	38
6						1	1			2
7					2		3		1	6
8		28		35	27	1	2	13		19
9				3	16				1	2
10		1		36	30	1	2	12	12	67
T		29		153	169	4	12	126	21	160

I/D Ratio .408
Observation 2 - 30 minutes

C	1	2	3	4	5	6	7	8	9	10
1										
2				12	10				4	1
3										
4				10	6	1		94		15
5		2		35	111	1		5	24	37
6						3			1	2
7										
8		23		34	35			11		11
9		1		11	25				4	10
10		1		24	29	1		4	17	54
T		27		126	216	6		114	50	130