EVALUATION OF INNOVATIVE TECHNOLOGY: IMPLICATIONS FOR THE COMMUNITY POLICING ROLES OF LAW ENFORCEMENT OFFICERS

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Caran Colvin, Ph.D., Principal Investigator
San Francisco State University
ccolvin@sfsu.edu

Project Description

The policing profession in the United States is currently undergoing a rapid change as police departments around the country shift their emphasis from incident-driven responses to community policing activities (Scrivner, 1995). In response to the Violent Crime Control and Law Enforcement Act of 1994, many law enforcement agencies have been called upon to develop new and innovative approaches to solve their community crime problems. These approaches have required law enforcement agencies to rethink the way in which they define the effectiveness of police operations. Crime and arrest rates, for example, no longer serve as the sole criteria for judging an agency's effectiveness. In the new policing paradigm, effective policing involves identifying the source and nature of neighborhood problems and working to develop successful solutions.

The San Francisco Police Department (SFPD) illustrates a department that has expanded its definition of organizational effectiveness in order to accommodate its transition from an incident-driven agency to a problem-oriented one. The SFPD has had a long-term community policing plan since 1989. The SFPD defines community policing as a philosophy, management style, and organizational strategy that promotes (1) pro-active problem solving and police-community partnerships; (2) full service personalized policing where the same officer patrols and works in the same area on a permanent basis, from a decentralized place; and (3) a high quality of life in San Francisco's neighborhoods through police-community partnerships that identify, prioritize, and solve contemporary problems.

Because problem-solving involves a more intensive and long-term approach to crime prevention, departments implementing community policing are challenged to find methods of freeing up additional officer time to engage in problem-solving and community oriented activities. Indeed, "freeing up time" for problem oriented policing is an issue that has surfaced not only in San Francisco, but also in departments around the country as they attempt to implement innovative policing strategies. Sadd and Grinc (1993) documented perceptions that community policing is more time-consuming and uses more of scant police resources than traditional policing in all eight of the departments studied. After a thorough self-examination, New York City's police department concluded that to make a transition to community policing, it would be necessary to expand greatly the size and functions of the Community Patrol Officer Program (CPOP) units (Pate & Shtull, 1994). Other operational and structural changes, they decided, would also be required, including an increase in the number of officers assigned to patrol cars. In another example provided by Lurigio and Skogan (1994), officers in Chicago's Alternative Policing Strategy (CAPS) program were organized into "beat teams" in small geographical areas to work with community members to solve problems. To give officers time to do this, the burden of 911 calls was shifted to rapid response teams and tactical units.

In recognition of the labor-intensive nature of community policing, all levels of management in the SFPD are responsible for finding "work-load reduction strategies" to give personnel more time to devote to proactive problem solving. Since the SFPD adopted the community policing philosophy department-wide, it has implemented many strategies to expand and improve its community policing efforts. Yet difficulties in

maintaining existing efforts arose due to lack of personnel to fully implement already adopted strategies.

In an effort to facilitate its work-load reduction strategies, the SFPD applied for and was awarded a COPS MORE grant in June 1995 to implement innovative technology—Mobile Computing Terminals (MCTs) or laptop computers—into its daily police operations. The MCTs represented a potential time-saving device for officers on patrol. With funds from COPS MORE, the SFPD purchased 336 MCTs to replace the KDT-480 dumb terminals that were installed in patrol cars. Funding to purchase software that would enable the electronic submission of reports from the field was also provided. The installation of the MCTs into patrol cars and the electronic submission software were part of an administrative strategy to increase the efficiency of the work process by shifting the entire Department to computerized incident reporting. Under the previous system, the Department estimated that two hours of each officer's shift was spent traveling to the district police station to access computer equipment to complete crime reports, or handwrite the standard seven-page report, as no portable computers were available for use in the field.

This equated to approximately ten hours of field time lost per two officer unit and six hours per one officer unit during a 24-hour period. By taking the hours saved per officer to complete crime reports, the Department projected that the new mobile computing system would provide an additional 409 officer equivalents per year redirected towards time spent in the field on community policing. Patrol officers assigned to units with newly installed MCTs were expected to respond to emergency calls for service, investigate crimes and complete their crime reports while remaining in

the neighborhoods they patrolled. In addition to these traditional policing responsibilities, implementation of the MCTs was expected to free up time for officers to engage in proactive problem solving and building police-community partnerships.

The COPS MORE award to the SFPD for the implementation of MCTs into its daily operations provided an opportunity to contribute to the national knowledge base on organizational effectiveness within the context of law enforcement. Furthermore, an evaluation of the COPS MORE initiative would reveal the extent to which operational efficiency and service quality varied as a function of computerization. The National Institute of Justice funded the evaluation and researchers at San Francisco State University (SFSU) assessed the extent to which MCTs optimized operational efficiency and quality of service. The evaluation examined the SFPD's strategy of technological innovation to optimize efficiency by reducing report-writing time: Did MCTs save time? Second, the project evaluated whether or not the MCTs were associated with improvements in service quality: was the time saved allocated to community policing?

The evaluation was intended to identify characteristics that contributed to organizational effectiveness. While the direct effect of computerization on operational efficiency has been recognized, no one has studied the corresponding indirect effect of technological innovation on community policing. It was conceivable that rapidly freeing up time of existing personnel, such as the department intended with the introduction of MCTs, was an especially effective way to facilitate the secondary goal of improving service quality in the form of community policing. The evaluation examined the efficacy of a technological intervention to improve operational efficiency, service quality, and the

corresponding changes in officers' attitudes and behaviors associated with successfully integrating the use of MCTs for computerized incident reporting into the work process.

Project Goals

This project evaluated the effect of Mobile Computer Terminals (MCTs) on two measures of organizational effectiveness that were operationalized as

1) The number of hours saved through implementation of MCTs and,
2) The allocation of time saved to community policing.

Goal #1: The Number of Hours Saved. Until now, only a handful of studies considered how technology has been used to shape the way in which police departments attempted to manage local crime rates. For example, Nunn (1993) hypothesized that mobile digital terminals (MDTs) would improve crime-fighting capabilities in the areas of vehicle theft clearances and recoveries. He examined motor vehicle thefts, clearances, and recovery rates from 1980 to 1990 using an interrupted time series deign with implementation of the MDTs as the intervention. Nunn's study did not support the hypothesis that MDTs would significantly reduce the rate of motor vehicle theft.

In a subsequent study using data that he collected in 1993, Nunn (2001) examined the effects of computerization on the efficiency of police operations in 188 municipal police agencies. He found that compared to police departments with low levels of computerization, departments with high levels of computerization employed more technical employees, spent more per capita, and employed fewer sworn police officers. Although the efficiency of police operations associated with computerization were demonstrated, the extent to which computerization was associated with improvements in the quality of police services or public-safety outcomes was not addressed. Nunn

acknowledged that the extent to which computerization would simultaneously reduce staffing levels and sustain the quality of services provided to the community ought to be addressed in subsequent research efforts. In a more recent study, Nunn and Quinet (2002) found that patrol officers using new computer technology produced about the same amount of added value as a control group working without the technology.

Issues related to the human-computer interface have been used to explain the lack of productivity gains associated with new computer technology. Acceptance of computer technology by its end-users has been deemed a necessary condition for its success. Davis (1989) developed the technology acceptance model (TAM) in order to identify the variables that influenced computer acceptance. Perceptions of ease of use and usefulness were identified as two important system attributes that influenced computer acceptance. Users who perceived new technology as useful and easy to use were more likely to integrate it into the work process (Davis, 1989). This finding suggested that it was important to consider the interface between computers and system attributes when exploring the ways in which technological innovation affected potential time saved.

Thus, police officers' perceptions of ease of use and usefulness were considered as moderating factors in the current study. We expected that the effects of technological innovation on the number of hours saved would be moderated by police officers' perceptions of ease of use and usefulness of the MCTs. Officers were expected to shift report-writing tasks from the station to the field. Given the effect of system attributes on the use of technology, we examined perceptions of ease of use and usefulness as covariates in the relationship between the MCTs, and the time taken to write and file reports and the subsequent shift of this task from the station to the field. In other words,

to successfully accomplish our program goal—to assess the number of hours saved through implementation of the MCTs—we also examined the role that system attributes played in integrating MCTs into the work process.

Goal #2: The Allocation of Time Saved. Our second program goal was to assess changes in officers' community policing roles resulting from technological innovation. Given that the technological innovation of the MCTs was expected to reduce time spent writing and filing reports, we planned to examine how officers allocated the time saved. Did officers allocate time saved by using the MCTs to engage in proactive problem-solving, building police-community partnerships, patrolling and working in the same area on a permanent basis, and building internal community within the police department?

We interpreted the SFPD's definition of community policing within the framework provided by Cordner (1997). He identified four dimensions of community policing: philosophical, strategic, tactical, and organizational. We explored the extent to which community-policing elements associated with each dimension were evident in SFPD police activities. The philosophical dimension contains elements of building police-community relationships and we considered that it might be a primary element in encounters with civilians. Patrolling and working in the same area on a permanent basis is an element found in the strategic dimension of community policing. We expected that patrolling and working in the same area might be a primary element of specific patrol. The tactical dimension contains elements of proactive problem solving and was expected to reflect a primary element in calls for service. Finally, building internal community within the police department is an element of organizational community policing. We considered that it might reflect a primary element in station activity.

Adopting Cordner's (1997) framework facilitated our efforts to develop an operationalization of community policing. We were able to develop behavioral examples of community policing as well as an attitudinal measure of the construct. In turn, our efforts to assess the extent to which changes in work processes required changes in the behaviors and attitudes of employees who have been the target of change were less problematic. Technology innovation was expected to indirectly shape officers' behaviors and attitudes via time saved; engaging in community policing would occur only if officers had the time to do so. When expected gains in productivity require new patterns of behavior and attitudes, the effect of technology on work roles may be latent and may evolve over the long-term. One cannot assume that changing the work process (i.e., introducing technology into the workplace) necessarily leads to an immediate increase in effectiveness (Landauer, 1995).

Rosenbaum, Yeh, and Wilkinson (1994) noted that a major barrier to police reform is attitudinal resistance among police personnel. However, Rosenbaum et al. found that once officers were engaged in problem-oriented policing, they reported positive changes in attitudes toward community policing, more support for professional policing, and greater receptivity to change. Clearly, another factor related to accomplishing the second evaluation goal was officers' attitudes toward community policing. It was important to understand officers' opinions about the program, its effectiveness, and its chances for success. These opinions were likely to moderate the relationship between changes in the work process and the allocation of time to police activities: officers who had positive attitudes toward community policing would likely allocate time to proactive problem-solving, building police-community partnerships,

internal SFPD community building, and developing a knowledge base about criminal activity within the particular community served. In this study we considered how officers' attitudes toward community policing moderated the allocation of time to police activities.

Summary

Two major program goals were evaluated. The first program goal was evaluated as the direct effect of technological innovation on the operational efficiency of the SFPD. The time saved by writing reports on MCTs and their electronic submission from the field was assessed. The second program goal was evaluated as the indirect effect of the MCTs on service quality. Improvements in service quality were expected to occur only if the MCTs freed up time for officers to devote to community policing. Furthermore, time saved and allocation of time to community policing were expected to require corresponding changes in officers' attitudes and behaviors.

Scope and Method

Overview

This project evaluated the operational efficiency of MCTs and corresponding changes in service quality. We evaluated time saved and the allocation of time to community policing with multiple methods. The two systematic methods used for this research were direct observation of the behavior of officers on patrol, including measurement of time to complete reports and time engaged in police activities, and pencil-and-paper surveys of attitudes toward computers and community policing. The design for measuring these methods was the Solomon four-group. This design allowed us to address a broad range of confounding factors, and to acquire a richer and more conclusive understanding of the factors involved than would be possible otherwise.

Unit of Analysis

The basic unit of measurement and analysis was the ride-along. Random combinations of shift halves and sectors were used to develop the ride-along schedule. We sampled from four shifts; 0600-1600, 1100-2100, 1600-0200, and 2100-0700. The shift half was a five -hour period that occurred either during the first half or the second half of the shift. During their shift, officers were assigned to a district sector, and they patrolled that sector for the entire time. The shift halves and sectors that were randomly sampled at Time 1 were sampled again at the successive measurement periods.

Due to the longitudinal nature of the study it was not possible to measure individual patrol officers as the unit of analysis. Officers were rotated on a regular basis from one district station to another. The nature of police work differed significantly between district stations, so measuring the same officer at two different stations would introduce a confounding factor into

the study. Within a district station, shift and sector provided a level of analysis that was consistent across the different measurement periods, and thus was less likely to introduce extraneous factors into the study.

Study Participants

Of the 1,091 sworn members of the San Francisco Police Department, 819 participated in the survey and ride-along observation activities across the three time periods: 163 at Time 1; 205 at Time 2; and 451 at Time 3. The 819 patrol officers were asked to complete surveys on computer attitudes and community policing and a subset of 463 officers participated in the observational activities: 96 at Time 1; 185 at Time 2; and 182 at Time 3. Patrol officers participated in the observation study if they were assigned to one of the shift and sector combinations that were randomly selected for a ride-along. Demographic information is presented in Tables 1 and 2. The first table shows the mean hours of training on community policing principles and practices that the respondents received in the past six months and the number of years they had used a computer. Information is presented in Table 2 regarding the respondents' education, gender, ethnicity, age, tenure in the SFPD, and participation in formal computer training. The table shows the response category selected by the greatest percentage of the respondents.

Both tables show information across the three time periods, which provide an indication of the extent to which the participants varied at each measurement period. Significance tests were conducted to determine the stability of the respondents' demographic characteristics across the three time periods. Number of hours of community policing training and number of years of computer use were analyzed in a one-way ANOVA. Both analyses produced null results, which indicated that the respondents sampled at each time period did not differ in the

amount of community policing training they had received or in the number of years they had used computers. A chi-square test was computed for each variable presented in Table 2. All of the tests produced null results, which indicated that the respondents sampled at each time period did not differ in regard to education, gender, ethnicity, age, tenure in the SFPD, or participation in formal computer training.

Dependent Variables

We undertook direct observation of policing activity in patrol cars (ride-alongs) in order to accurately measure the dependent variables considered in the study. Prior to the start of the project we conducted a task analysis of police work in order to identify the various components of policing. We held focus groups with officers, we read the SFPD community policing manuals, and we directly observed officers during pilot ride-alongs in order to identify the major tasks they performed. We used this information to define the major activities of police work. In turn, these activities served as the foundation for the dependent variables measured in the study. Figure 1 shows the dependent variable structure of the data we collected.

Police activities were identified as traditional policing, community policing, or a combination of the two. We used Cordner's (1997) dimensions of community policing in order to determine the extent to which each activity represented community policing. Community policing behaviors that represented Cordner's philosophical, strategic, tactical, and organizational dimensions were identified from a content analysis of the SFPD community policing manual. Cordner's dimensions were translated as (1) external community building (philosophical); (2) developing a knowledge base about criminal activity within the particular community served (strategic); (3) proactive problem-solving (tactical); and (4) internal community building (organizational).

Coding Police Observations. Field researchers were trained to code police behaviors associated with the secondary activity blocks. Each ride-along was made up of a series of policing incidents. A particular policing incident would first be categorized in terms of the secondary activity block that it represented. The observer would then record the amount of time the officer spent engaged in the incident (the time spent on all of the incidents within a particular activity block would be summed in order to produce the overall time spent on that particular time block within a given ride-along).

Next, the observer would determine if community policing elements were demonstrated within the incident. If at least one element was demonstrated, the incident was labeled as community policing. All of the incidents within encounters with civilians and specific patrol contained at least one element of community policing. The philosophical dimension was the primary attribute of encounters with civilians with its emphasis on external community building. With its emphasis on developing a knowledge base about criminal activity within the particular community served, specific patrol was defined in terms of the strategic dimension. Thus, these two variables represented unique measures of community policing.

Calls for service and station activity were multi-dimensional because they included elements of traditional and community policing: some incidents contained elements of community policing and others did not. The tactical dimension was the primary attribute of calls for service in which the emphasis was on proactive problem-solving. The organizational dimension was the primary attribute of station activity where internal community building is emphasized. For one activity block, general patrol, no elements of community policing were recorded. Thus, this variable represented a unique measure of traditional policing.

Operationalization of Time Spent. The first category of dependent variables measured in the study was *time spent*. Time spent on the job was analyzed within the blocks of police activity. Station time and field time were computed by aggregating the amount of time officers spent on respective secondary activity blocks. The secondary station blocks provided measures of time spent on report writing, computer use, breaks, and administrative activities at the station. The secondary field blocks provided measures of time spent in the field on calls for service, patrol, administrative activities, computer use, encounters with civilians, breaks, and report writing.

Time spent on computer use at the station and in the field before and after the MCT installation was measured in order to determine the amount of time saved as a result of using the MCTs. In addition to time saved, the allocation of time was measured. Time spent on calls for service, general patrol, specific patrol, and encounters with civilians before and after the MCT installation was measured in order to determine changes in time allocation associated with the MCTs. The analysis of time allocation would provide an indication of the extent to which officers distributed their time between community policing and traditional policing activities.

Operationalization of Community Policing Behaviors. A second category of dependent variables was community policing behavior. Within each activity block, the number of community policing elements demonstrated was recorded. The District Stations Code Book, shown in Appendix A, lists examples of the community policing elements for each of the secondary activity blocks. The number of community policing elements observed in station activity, calls for service, specific patrol, and encounters with civilians before and after the

MCT installation was measured in order to determine changes in community policing behavior associated with the MCTs.

Independent Variables

Two within-subjects variables were measured as location and police activities. Two levels of location were station and field. Police activities were defined as station activity, general patrol, specific patrol, encounters with civilians, and calls for service. Measurement period was a between-subjects variable measured as Time 1, Time 2, and Time 3. Installation period was a between subjects variable with two levels defined as pre-Time 2 and post-Time 2 installation of the MCTs. Two levels that included presence of a Time 1 observation and absence of a Time 1 observation defined Time 1 observation, a between subjects variable.

Covariates

Computer Acceptance Survey. A focus group with officers indicated that computer acceptance was a multi-dimensional construct. Patrol officers expressed the belief that compared to the dumb terminals, the new MCTs would provide more effective retrieval of and access to information and that the new system would be easier to use. The technology acceptance model developed by Davis (1989) served as the foundation for developing survey items. The survey contained items that reflected usefulness and ease of use dimensions developed by Davis (1989).

Three raters assigned each item to the computer attitude category that they believed it represented in order to determine the construct validity of the survey. The three raters were faculty members in psychology and criminal justice who were trained to serve as subject matter experts (SMEs). Inter-rater agreement among the SMEs on the assignment of items to

categories was used to retain items for the final survey: an item was deleted from the survey if the inter-rater agreement was lower than sixty-six percent. An inter-rater agreement of sixty-six percent or more was obtained for 12 items, and these items made up the final survey. Seven items reflected ease of use and five items reflected usefulness. The Computer Acceptance Survey is shown in Appendix A.

Community Policing Survey. Members of the research team reviewed the community-policing manual prepared by the SFPD. The research team adopted Cordner's (1997) four major dimensions of community policing defined as philosophical, strategic, tactical, and organizational. In a focus group with a group of patrol officers, the dimensions and their definitions were presented and the officers were asked to provide examples of each one. Forty-nine survey items representing the four categories were developed from the examples provided by the officers.

Three raters assigned each item to the community policing category that they believed it represented in order to determine the content validity of the survey. The three raters were faculty members in psychology and criminal justice who were trained to serve as subject matter experts (SMEs). Inter-rater agreement among the SMEs on the assignment of items to categories was used to retain items for the final survey: an item was deleted from the survey if the inter-rater agreement was lower than sixty-six percent. An inter-rater agreement of sixty-six percent or more was obtained for 27 items, and these items made up the final survey. The community policing survey is shown in Appendix A.

Procedure

Field researchers who participated in ride-alongs received extensive training on observing relevant behaviors. During the four-hour workshop, the data structure of the project

was explained to the field team. The primary components of station time and field time were presented and examples of secondary components were discussed. In order to operationalize the secondary components, the research team viewed segments of the COPS television program and then discussed the components of policing behavior illustrated by each one.

Prior to data collection activities at each district station, members of the research team attended roll call at all of the shifts in order to provide information about the study to patrol officers. At the beginning of a given ride-along, the study was explained to the patrol officer and his/her informed consent was obtained. The officer was told that his/her participation was voluntary and that he/she could withdraw from the study at any time. During the five-hour ride-along, the observer collected information on the amount of time the officer spent on the various secondary activities outlined in Figure 1. At the end of the ride-along, the officer was asked to complete the Computer Attitude and Community Policing Attitude Surveys. Survey responses and observation data were anonymous and could not be linked to the officers. Only the ride number identified the observations and surveys. Officers who did not participate in a ride-along were asked to complete the surveys and place them in a drop box at the district station. These surveys were anonymous.

Design of the Study

Table 3 shows the observation plan that guided data collection activities in this study. Various combinations of installation period and Time 1 observation resulted in four groupings of the 10 district stations. The ride-alongs at Time 1 occurred in the months prior to the installation of the MCTs. At Time 1, 50 five-hour patrol periods were randomly selected and directly observed at station groups A and B. At pre-Time 2, the MCTs were installed at station groups A and C. Across all four of the station groups at Time 2, two hundred five-hour periods

were observed (50 per each of the four station groups). At post-Time 2, the laptop installation was completed at station groups B and D. At Time 3, another 200 five-hour periods were sampled and observed over a one-year period.

Timing of Observations. Two factors that guided the observation schedule were seasonal effects and the SFPD's plan for installing the laptops. Table 4 shows the number of calls for service by district for the four quarters of 1996. The data indicated that seasonal differences did occur, most notably among quarter 1, quarter 3, and quarter 4. This data was taken into consideration when scheduling observations of patrol officers' behavior at Times 1, 2, and 3. The first set of observations at station group A began in quarter three; station group B was observed in quarter four; station group C was observed in quarter three; and station group D was observed in quarter one. This schedule was repeated at Time 2 and Time 3 measurement periods.

Another consideration in scheduling the observations was the SFPD's plan for implementing the MCTs. Given the potential impact of seasonal effects, the research team requested that the SFPD delay its installation of the laptops. For one-half of the stations, the laptops were installed at pre-Time 2 measurement period, and at post-Time 2 measurement period for the other one-half. The first installation phase of the MCTs occurred in the stations randomly assigned to Groups A and C. This installation phase occurred from June 1999 to November 1999. The second installation phase of the MCTs occurred in those stations randomly assigned to Groups B and D. The second installation phase occurred from December 1999 to July 2000.

Solomon Four-Group Design. The simplest quasi-experimental design would observe the behavior of patrol officers in five stations that had received MCTs compared to officers in

five stations that had not yet received them. The extraneous effects of observation potentially contaminate a design that simply compares an experimental group to a control group. A design that permitted the researchers to estimate and control for the effect of observation is the Solomon four-group design. Table 3 shows how the design was applied to the study. Groups A and C represented experimental groups and groups B and D were control groups. Stations one and two, for example, were the first stations scheduled for installation, and thus these two stations were assigned to Group A. Stations three and four (Group B) were scheduled next, and they served as a control group to Group A. Stations five, six, and seven were then scheduled to receive the laptops, and they were assigned to Group C. Group D was formed from Stations eight, nine, and ten and this group served as the control group to Group C.

Within the experimental groups, group A was observed in ridealongs and surveyed (pretest, Time 1) before installation of the MCTs, while group C was not. In the control groups, group B was observed and surveyed with a pretest-type observation (Time 1) and a posttest-type observation (Time 2), but without having yet received MCTs. Thus, Group B allowed us to estimate the effect of observation alone. Nachmias and Nachmias (1987) noted that the additional set of control and experimental groups that are not pre-tested provide a measure of the reactive effect of testing. They suggest that comparing the experimental groups and the control groups provided an indication of the generalizability of the results; that is, if the treatment had an effect even in the absence of the pretest, the results can be generalized to populations that were not measured prior to exposure to the treatment.

An additional posttest measurement period at Time 3 was added to the design in order to detect “effects extended in time” (Nachmias and Nachmias, 1987). By Time 3, all four groups had received the MCTs. Nachmias and Nachmias noted that most designs assume that

the effect of an intervention can be observed within a very short period of time. They suggested that some interventions, particularly those that target attitudes, would elicit long-term effects that are spread out over time. In the current study, the effects of the MCTs on time taken to complete reports, for example, might not be immediately observed. The installation of the technology was relatively quick, but accommodation to the technology and the desired shift in attitudes and policing practices were likely to occur much more slowly. Therefore, the measurement of change in attitudes and behaviors should be spread out over time. In the current evaluation, the additional posttest (Time 3) occurred 24 months after the first posttest (Time 2) in order to tap latent effects of the new technology. A comparison of the four groups at Time 3 would indicate latent effects of the new technology; that is differences between the experimental and control groups (both of whom received the technology before Time 3 but at different times in relation to Time 2) would indicate latency effects.

Data Analysis Plan

In order to maximize the benefits of the design used in the study, two subsets of the design were analyzed. The first subset consisted of analyzing Groups A, B, C, and D at Time 2. This subset represented a pre-test post-test control group design with Groups A and C as the experimental groups and Groups B and D as the control group. The second subset analyzed Groups A, B, C, and D at Time 3. This subset provided an analysis of latency effects of new technology. For both subsets, time spent using the computer, overall time spent at the station and in the field, allocation of time to policing activity, and number of community policing elements were analyzed by treatment (pre-Time 2 or post-Time 2 installation) and testing (Time 1 observation or no Time 1 observation).

Several analyses were conducted to determine the effect of the MCTs on time saved, allocation of time, and behavior. A series of repeated measures ANCOVA tests were planned but due to a lack of significant covariates, the results of the repeated measures ANOVA tests are reported. For all repeated measures ANOVA tests an alpha level of .01 was required for significance testing.

The first set of analyses measured the time saved associated with the MCTs. A series of repeated measures ANOVA tests were conducted to compare the amount of time spent on computer use at the station and in the field. The amount of time spent on computer written reports across the within-subject variable of location, and the between-subject variables of treatment and testing were analyzed. A similar ANOVA test was conducted for the amount of time spent on other computer use.

The next set of analyses addressed the second goal of the project, the allocation of time to police activities. A series of repeated measures ANOVA tests were conducted to determine (1) how officers distributed their time overall between the station and in the field and (2) changes in time allocated to community and traditional policing activities. In each analysis, the dependent variable was measured across the within-subject variable of activity, and the between-subject variables of treatment (pre-Time 2 or post Time-2 installation) and testing (Time 1 observation or no Time 1 observation).

The final set of analyses considered behavior change associated with the MCTs. A repeated measures ANOVA test was conducted to determine change in the number of community policing elements observed in police activities. The dependent variable, community policing elements, was measured across the within-subject variable of

activity, and the between-subject variables of treatment (pre-Time 2 or post Time-2 installation) and testing (Time 1 observation or no Time 1 observation).

Findings

Descriptive statistics were computed for the dependent and independent variables measured in the study. Table 5 presents the mean, standard deviation, and sample size of each variable. Correlations between all variables are presented in Tables 6a, 6b, and 6c. In Table 5 and the set of Table 6, the data are presented separately for each of the three measurement periods.

Goal #1: Did the laptops save time?

Measuring computer use at the station and in the field assessed the extent to which the MCTs improved operational efficiency. Time spent on computer use was analyzed using the within-subject variable of location (station and field) and treatment (pre-Time 2 or post-Time 2 installation) and testing (Time 1 observation or no Time 1 observation) served as between subject variables. The latent effect of technology on computer use was also examined. The analysis produced null results, which indicated the absence of a latency effect.

Report Writing and Other Computer Use. This analysis investigated time saved as a function of computer use. First, the amount of time officers spent writing computer written reports was examined. Table 7a presents the pre-test Time 1 and post-test Time 2 means for computer written reports at the station and in the field and Table 7b presents the Time 2 means analyzed in the repeated measures ANOVA. The analysis of time spent completing computer-written reports produced null results.

Table 8a presents the pre-test Time 1 and post-test Time 2 means for other computer use at the station and in the field and Table 8b presents the Time 2 means analyzed in the repeated measures ANOVA. A significant interaction between location,

treatment, and testing emerged for other computer use (F(1,184)=10.03,p=.00). The ANOVA summary table is presented in Table 8c. The effect size of the within-subjects model was estimated as R^2=.63.

Additional analyses were conducted to measure the simple effects of treatment and the simple effects of testing for other computer use. The analyses produced null results for other computer use at the station. Regarding other computer use in the field, the tests of the simple effects of treatment at each level of testing were significant for the group that was observed at Time 1 (F(1,91)=51.83,p=.00) and for the group that was not observed at Time 1 (F(1,94)=86.19,p=.00). For officers who were observed at Time 1, those using MCTs spent more time on other computer use (Mean=35.06) than those who were not using MCTs in the field (Mean=.00). For officers who were not observed at Time 1, those using MCTs in the field spent more time on other computer use (Mean=18.32) than those who were not using MCTs (Mean=.00). The means are displayed in Figure 2.

Although the simple effects of testing at each level of treatment did not produce a significant effect for the post-Time 2 installation group, a significant effect was found for the pre-Time 2 installation group (F(1,93)=10.43,p=.00). For officers using computers at Time 2, the findings indicated that the group observed at Time 1 spent more time using MCTs for other reasons in the field (Mean=35.06) than the group that was not observed (Mean=18.32). Figure 2 displays the testing effect in graphical form.

Goal #2: Allocation of Time Saved

The second goal of the study was examined in a series of analyses that considered allocation of time to various police activities at the station and in the field. Overall time

spent was analyzed using the within-subject variable of location (station and field), and treatment (pre-Time 2 or post-Time 2 installation) and testing (Time 1 observation or no Time 1 observation) served as between subject variables. Allocation of time was analyzed using the within-subject variable of activity (calls for service, general patrol, specific patrol, and encounters with civilians), and treatment (pre-Time 2 or post-Time 2 installation) and testing (Time 1 observation or no Time 1 observation) served as between subject variables. The latent effect of technology on allocation of time was also examined. The analyses produced null results, which indicated the absence of a latency effect.

Overall Time Spent. The pre-test Time 1 and post-test Time 2 means of station time and field time are presented in Table 9a. Table 9b presents the Time 2 means used in the analysis. The ANOVA produced a significant main effect of location ($F(1,179)=383.949, p=.00$). The ANOVA summary table appears in Table 9c. The effect size of the within-subjects model was estimated as $R^2=.71$. The results indicated that officers spent more time in the field (mean=212.891) than at the station (mean=65.233). The means are displayed in Figure 3.

Time Spent on Police Activities. Table 10a presents the pre-test Time 1 and post-test Time 2 means for police activities and Table 10b presents the Time 2 means analyzed in the repeated measures ANOVA. A significant interaction between police activity and treatment ($F(3,537)=23.70, p=.00$) and a significant interaction between activity and testing ($F(3,537)=6.76, p=.00$) emerged. The ANOVA summary table appears in Table 10c. The effect size of the within-subjects model was estimated as $R^2=.77$.

A series of one-way ANOVAs were conducted to explore treatment and testing effects at each level of police activity. The analyses of the simple effects of treatment and testing were not significant for encounters with civilians. Regarding the other activities, a significant simple effect of treatment emerged for calls for service ($F(1,181)=5.07, p=.03$). This finding suggested that officers who were using MCTs spent more time on calls for service (Mean=105.91) compared to officers who were not using MCTs (Mean=89.35). The means are presented in Figure 4. The one-way ANOVA measuring the simple effect of testing for calls for service produced null results.

A simple effect of treatment for general patrol was evident ($F(1,181)=40.05$, $p=.00$). Officers using the MCTs spent less time on general patrol (Mean=71.54) than officers who did not use the MCTs (Mean=119.39). The means are displayed in Figure 5a. A simple effect of testing was also significant for general patrol ($F(1,181)=7.16, p=.01$). The finding indicated that officers who were observed at Time 1 spent less time on general patrol (mean=84.60) compared to officers who were not observed at Time 1 (mean=106.52). The means are displayed in Figure 5b.

The final analysis in this subset revealed a simple effect of treatment for specific patrol ($F(1,181)=9.09, p=.00$). Officers using MCTs spent more time on specific patrol (Mean=23.48) than officers who did not use MCTs (Mean=9.23). The means are displayed in Figure 6a. A simple effect of testing was also significant for specific patrol ($F(1,181)=13.17, p=.00$). This finding indicated that officers who were pre-tested at Time 1 spent more time on specific patrol (mean=24.96) compared to officers who were not pre-tested at Time 1 (mean=7.98). The means are displayed in Figure 6b.

Behavioral Effects of the MCTs

The final set of analyses considered the number of community policing elements demonstrated in various police activities. The within-subject variable was police activity (station activity, calls for service, specific patrol, and encounters with civilians), and treatment (pre-Time 2 or post-Time 2 installation) and testing (Time 1 observation or no Time 1 observation) were analyzed as between-subject variables. The latent effect of technology on behavior was also examined. The analyses produced null results, which indicated the absence of a latency effect.

Table 11a presents the pre-test Time 1 and post-test Time 2 means for community policing elements and Table 11b presents the Time 2 means analyzed in the repeated measures ANOVA. A significant interaction between police activities and treatment emerged for number of community policing elements measured at Time 2 ($F(3,537)=6.17, p=.00$). The effect size of the within-subjects model was estimated as $R^2=.65$.

A series of one-way ANOVAs were conducted in order to identify the simple effects of treatment at each level of policing activity. The analyses for encounters with civilians, specific patrol, and calls for service did not produce significant results. However, a simple effect of treatment emerged for number of community policing elements demonstrated at the station ($F(1,180)=19.42, p=.00$). This finding indicated that officers who were using MCTs at Time 2 demonstrated more community policing elements at the station (Mean=.97) compared to officers who were not using MCTs at Time 2 (Mean=.29). The means are displayed in Figure 7.

Analysis and Discussion

A complex experimental design served as the basis for data collection, and we were able to isolate treatment from testing effects in order to evaluate the overall contribution of the MCTs. Furthermore, we were able to examine the latent effect of technology. The evaluation examined the SFPD's strategy of technological innovation to optimize efficiency by reducing report-writing time: Did MCTs save time? Second, the extent to which the time saved was associated with improvements in service quality was evaluated: how was time allocated to police activities in order to solve neighborhood crime problems?

Goal #1: Did the laptops save time?

In response to the first goal of this project regarding the time saved associated with the MCTs, the answer is a conditional *yes*. Officers were more likely to use the MCTs in the field for reasons other than report writing rather than return to the station. While efficiency gains were expected to arise from shifting report writing from the station to the field, we found that the lack of functional software prevented officers from transmitting reports from the field to the station. The amount of time officers spent preparing computer-written reports in the field was approximately zero by the end of the third observation period.

Nevertheless, officers took advantage of the MCTs when they were in the field by using them for other uses such as running checks on individuals and/or automobiles. In the past, this type of information would be gathered only at the station or through lengthy communication with dispatch. Officers allocated approximately 35 minutes of one-half of a 10-hour shift to the field as a result of using the MCTs for reasons other than report-

writing. However, a significant testing effect indicated that gains due to the MCTs were in part attributable to the officers' awareness of participating in a study. Officers who were not pre-tested allocated approximately 18 minutes during a five-hour shift to the field as a result of using the MCTs. Thus, given that the effects of the treatment were over and above those of testing *and* in the absence of a latent effect of technology, it is reasonable to assume that in a 10-hour shift, 36 minutes is an accurate estimate of time saved.

Goal #2: Allocation of time

The second goal of the study was to determine the extent to which changes in service quality were attributable to the MCTs. Given that service quality would improve only if officers were able to shift time spent at the station to field activities, we considered the overall allocation of time between the station and the field. We expected that officers would shift time spent at the station to the field after the MCTs were installed. However, installation of the MCTs did not result in more time spent in the field: officers spent significantly more time in the field than at the station regardless of when the MCTs were installed.

Given that officers were spending a significant amount of time in the field an extensive assessment of field time was provided by analyzing police activity as a within-subjects variable in a repeated-measures ANOVA of time spent. One consequence of the MCTs was an increase in the tactical dimension of community policing: the MCTs increased time spent on calls for service, an activity that contained elements of proactive problem solving. Other findings suggested a trade-off between traditional policing and community policing: time spent on general patrol decreased and time spent on specific

patrol increased. However, the presence of a testing effect for general patrol and specific patrol indicated that officers using the MCTs spent less time on general patrol and more time on specific patrol only when they were observed.

Behavioral Effects

Additional consideration of the relationship between technology and community policing was provided by analyzing changes in community policing elements in relation to the MCTs. The findings indicated that the number of community policing elements demonstrated during encounters with civilians, calls for service, and specific patrol remained stable after the MCTs were installed. However, an unintended consequence of the MCTs did emerge. A significant main effect for treatment indicated that officers who were using the MCTs demonstrated more community policing elements during station activity compared to officers who were not using the MCTs.

One explanation for the increase is that officers who were spending more time on other computer use in the field might not need to spend as much time using desktop computers for other reasons at the station. The time saved possibly freed up officers to engage in community policing at the station. We interpreted this finding in the context of the organizational dimension of community policing: officers spent time at the station engaging in internal community building.

Limitations of the Study

The experimental design that served as the basis for data collection in this study revealed significant testing effects that minimized the effects of the MCTs. The presence of a testing effect for time spent on general patrol and on specific patrol, for example, suggested that the community policing philosophy adopted by the SFPD was not

internalized in the district stations. Police activity related to general patrol and specific patrol was consistent with the philosophy only when officers were observed. The testing effects may indirectly reflect the extent to which a districts station's management philosophy supported officers' problem-solving efforts. Although the officers' attitudes toward community policing were assessed, the management philosophy of each district station was not. Future studies ought to consider the effect of technology *and* management philosophy on community policing.

Officers' attitudes toward community policing and technology acceptance were measured in the study, but they did not emerge as significant covariates. We used the logical method to construct the surveys, and their validation was limited. The factorial and predictive validity of the surveys was not assessed. Further exploration of the community policing and technology acceptance constructs is warranted, particularly as moderators of the relationship between police activities and technology innovation.

Another threat to internal validity was the technology itself. The lack of functional software, for example, probably accounted for the lack of findings regarding report writing in the field. The utility of this activity in the field was diminished by the inability to electronically submit reports. Officers were required to return to the station to submit reports, and it was reasonable to use the desktops located there in order to write them.

Conclusions and Implications

The findings of this study suggest two important factors to consider when introducing new technology into the workplace. First, software that complements and provides optimal use of the technology is essential. The SFPD experience revealed that hardware alone was not sufficient to realize expected gains in productivity. However, the SFPD officers were very innovative in their use of the MCTs—they optimized other computer use. In one station group, this function saved the officers approximately thirty-six minutes in a 10-hour shift. Instead of returning to the station to use the computer for other reasons, the officers were able to accomplish these tasks in the field. It would be beneficial to determine the added value of functional software to the thirty-six minutes saved due to other computer use in the field. Even though the software required for optimal use was not functional, the MCTs did not adversely affect service quality. Instead, officers spent more time on community policing activities after the MCTs were installed. Furthermore, after installation of the MCTs community policing elements at the station increased and remained stable in the field.

Second, testing effects were evident in many of the analyses. Officers who were observed responded differently than officers who were not observed. This finding suggested that perhaps technology acceptance and its link to community policing was not recognized by the SFPD. Although their responses were not measured, management's view toward technology and its instrumentality in accomplishing organizational goals would likely impact user acceptance. A management team that values innovative technology as a strategy for achieving productivity goals would likely create an organizational culture in which user acceptance of technology is recognized and

encouraged. Furthermore, new technology often requires employees to change their behaviors and attitudes in order to optimize its use. Management policies and practices facilitate these changes to the extent that they support employees' efforts to learn new behaviors and attitudes consistent with the organizational goals targeted by the new technology. For example, a management philosophy that values service quality is likely to support a culture in which community policing is highly rewarded. In this type of culture, technology and management philosophy would be in alignment, and would result in the successful adoption of behaviors and attitudes that support the goals of the organization. Thus, the final factor to consider is the extent to which management policies and practices shape the way in which officers respond to new technology.

References

Cordner, G. W. (1997). Community policing elements and effects. In R. Dunham & G. Alpert (Eds.), *Critical Issues in Policing: Contemporary Readings* (pp. 45-68). Prospect Heights, IL: Waveland.

Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, 319-340.

Landauer, T. K. (1995). *The Trouble with Computers: Usefulness, Usability, and Productivity.* Cambridge, MA: The MIT Press.

Lurigio, A. J. & Skogan, W. G. (1994). Winning the hearts and minds of police officers: An assessment of staff perceptions of community policing in Chicago. *Crime & Delinquency, 40*, 315-330.

Nachmias, D. & Nachmias, C. (1987). *Research methods in the social sciences.* New York, NY: St. Martin's Press.

Nunn, S. (1993). Computers in the Cop Car: Impact of the mobile digital terminal technology on motor vehicle theft clearance and recovery rates in a Texas city. *Evaluation Review, 17*, 182-203.

Nunn, S. (2001). Police information technology: Assessing the effects of computerization on urban police functions. , 221-234.

Nunn, S. & Quinet, K. (2002). Evaluating the effects of information technology on problem-oriented-policing: If it doesn't fit, must we quit? *Evaluation Review, 26*, 81-107.

Pate, A. M. & Shtull, P. (1994). Community policing grows in Brooklyn: an inside view of the New York City Police Department's model precinct. Crime & Delinquency, 40, 384-410.

Rosenbaum, D. P., Yeh, S. & Wilkinson, D. L. (1994). Impact of community policing on police personnel: A quasi-experimental test. *Crime & Delinquency , 40*, 331-353.

Sadd, S. & Grinc, M. G. (1993). *Implementation challenges in community policing: Innovative neighborhood-oriented policing in eight cities.* U.S. Department of Justice, National Institute of Justice, Washington, DC.

Scrivner, E. M. (1995). Community policing: New roles for police psychology. In M. Kurke & E. M. Scrivner (Eds.), *Police psychology into the 21st century* (419-433). Hillsdale, NJ: Erlbaum Associates.

Figure 1: Data Structure of the Dependent Variables

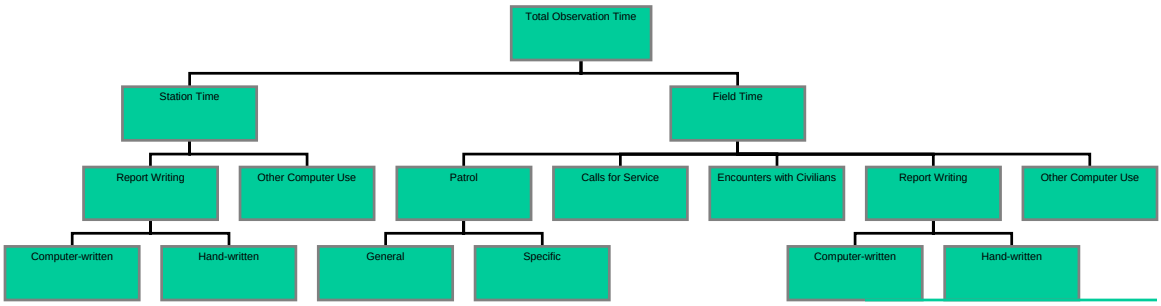

Figure 2a

3-way Interaction Between Installation Time, Measurement Period, and Location: Time Spent on Other Computer Use for Group A

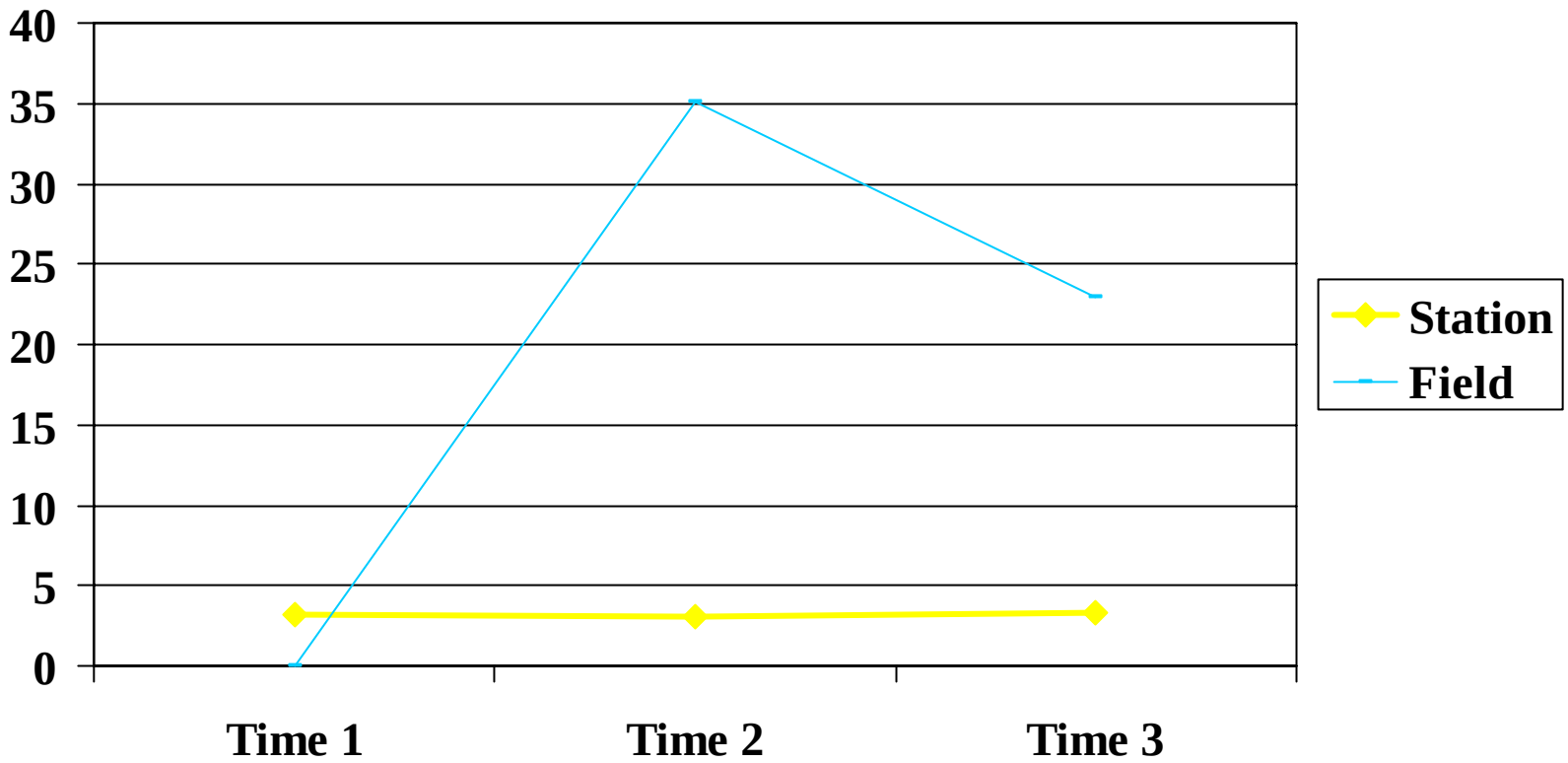

Figure 2b

3-way Interaction Between Installation Time, Measurement Period, and Location: Time Spent on Other Computer Use for Group B

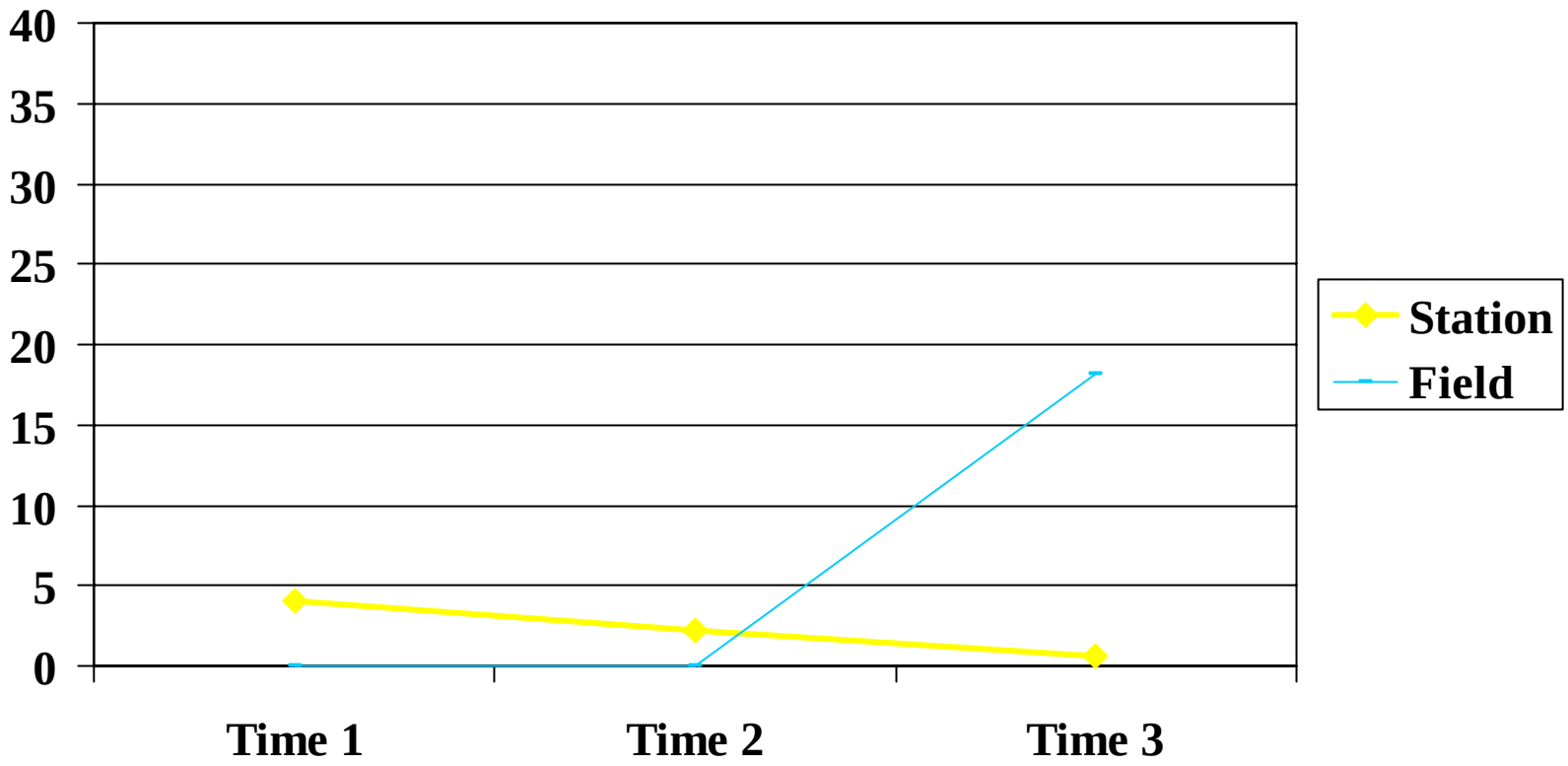

Figure 3

2-way Interaction Between Measurement Period and Location: Time Spent on Hand-written Reports

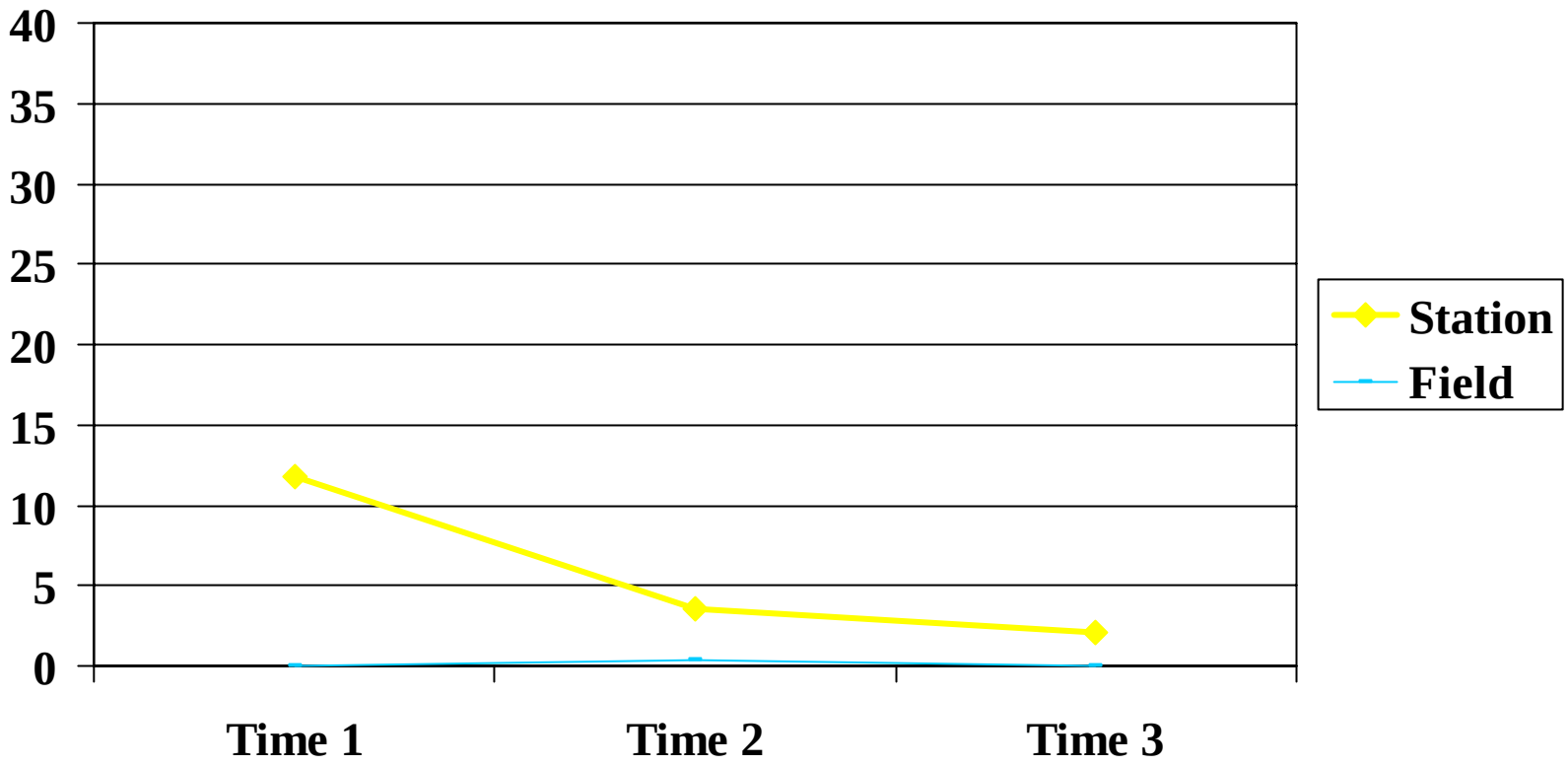

Figure 4a

Main Effect for Location: Time Spent on Computer-written Reports

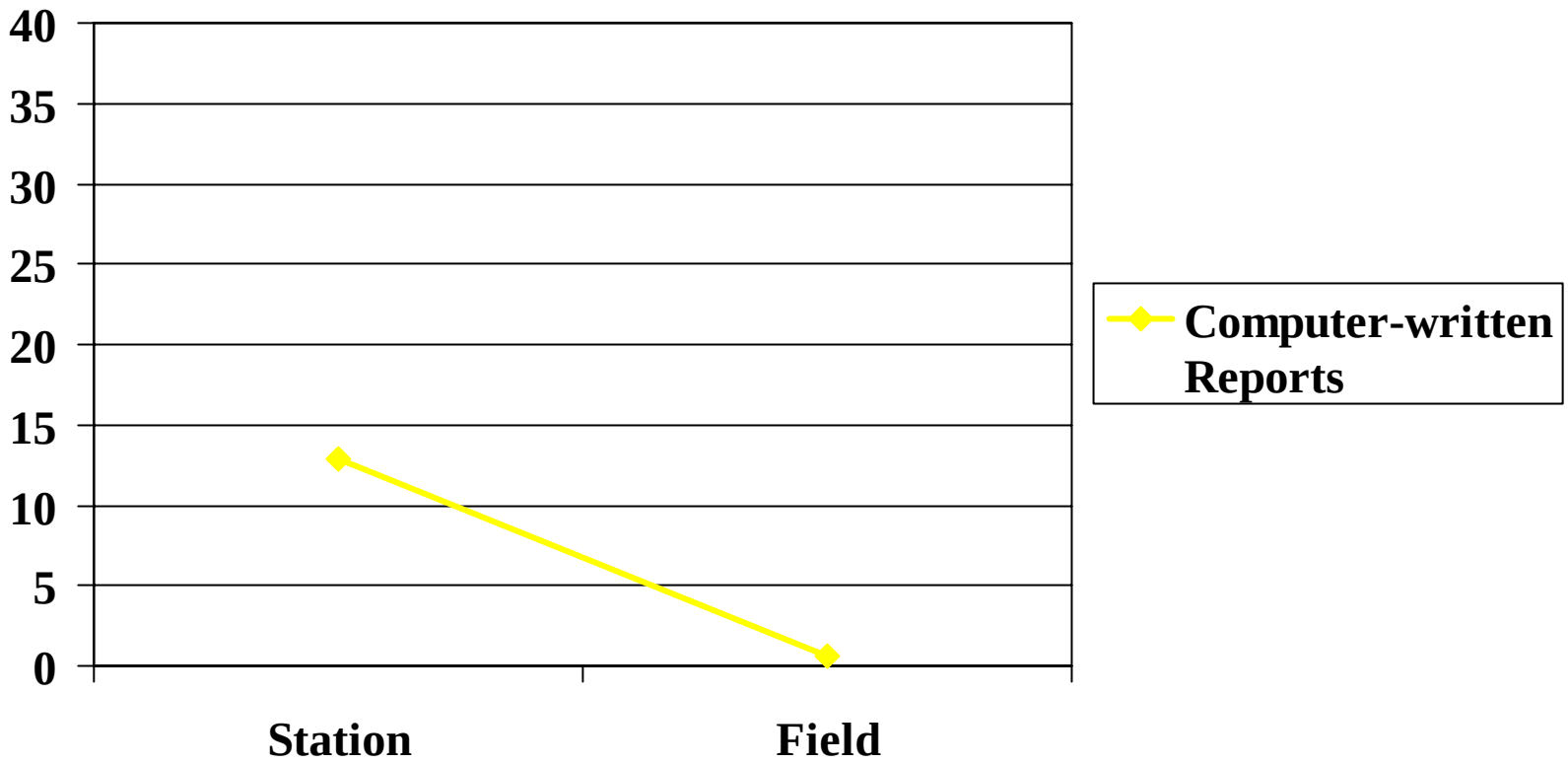

Figure 4b

Main Effect for Measurement Period: Time Spent on Computer-written Reports

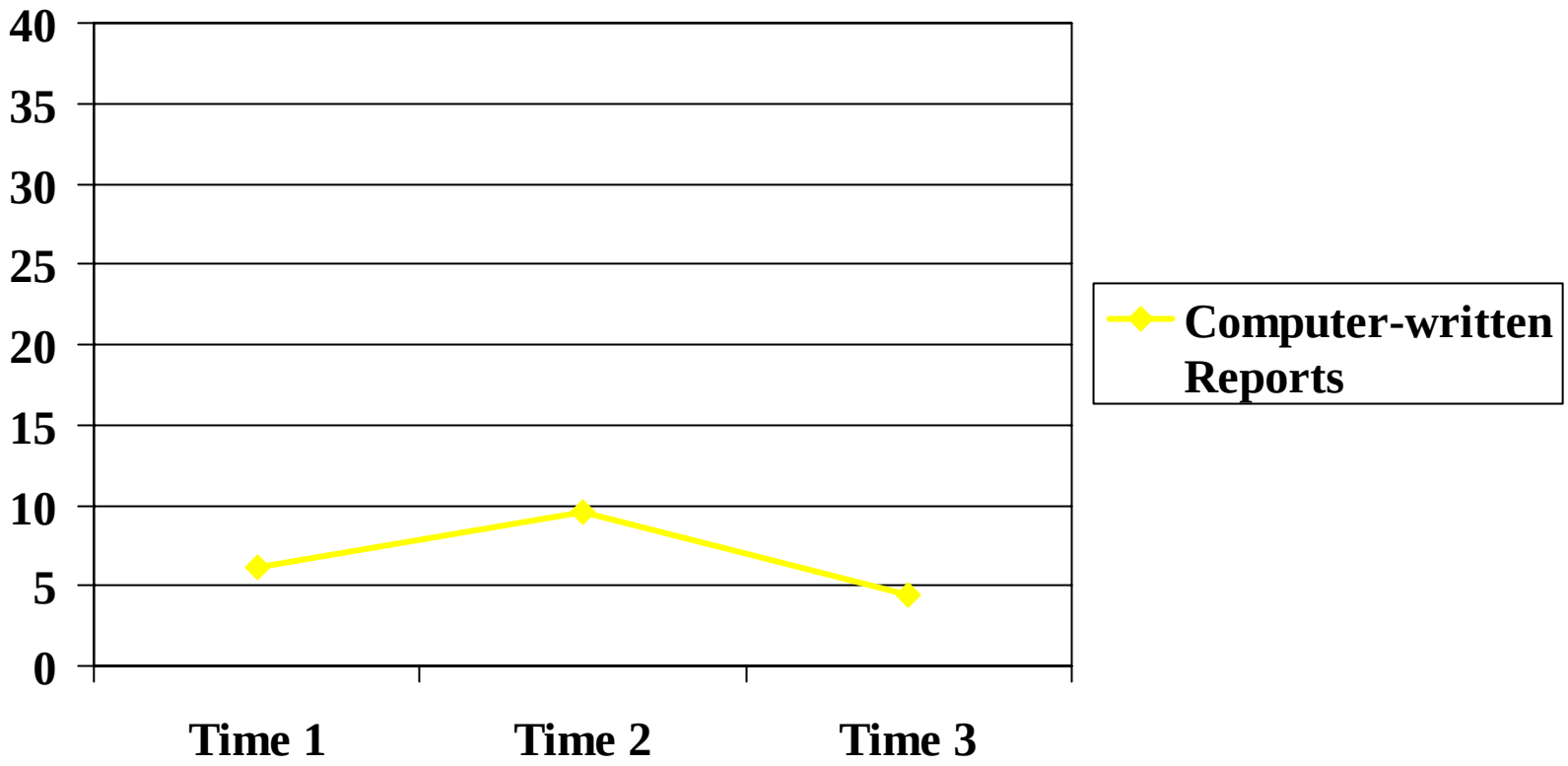

Figure 5a

4-Way Interaction Between Location, Installation Time, Measurement Period, and Time 1 Observation: Time Spent on Computer-written Reports for Group A

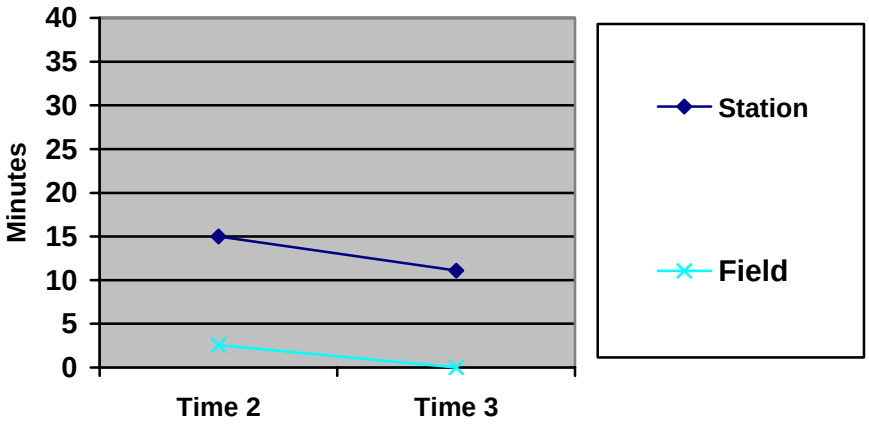

Figure 5b

4-Way Interaction Between Location, Installation Time, Measurement Period, and Time 1 Observation: Time Spent on Computer-written Reports for Group B

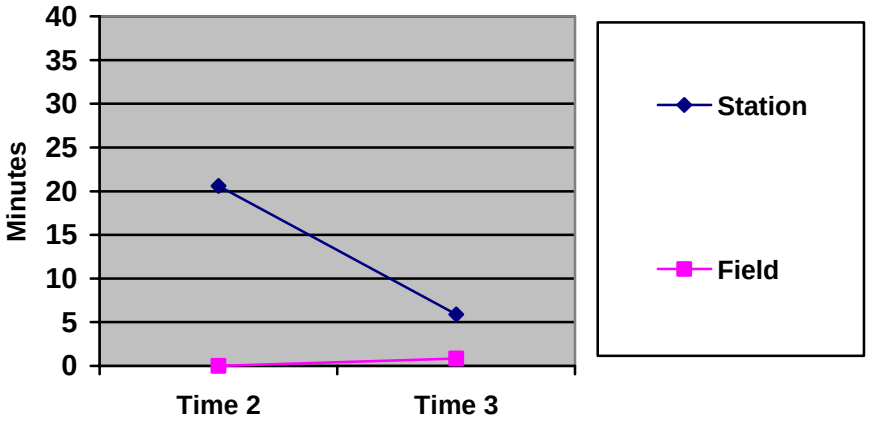

Figure 5c

4-Way Interaction Between Location, Installation Time, Measurement Period, and Time 1 Observation: Time Spent on Computer-written Reports for Group C

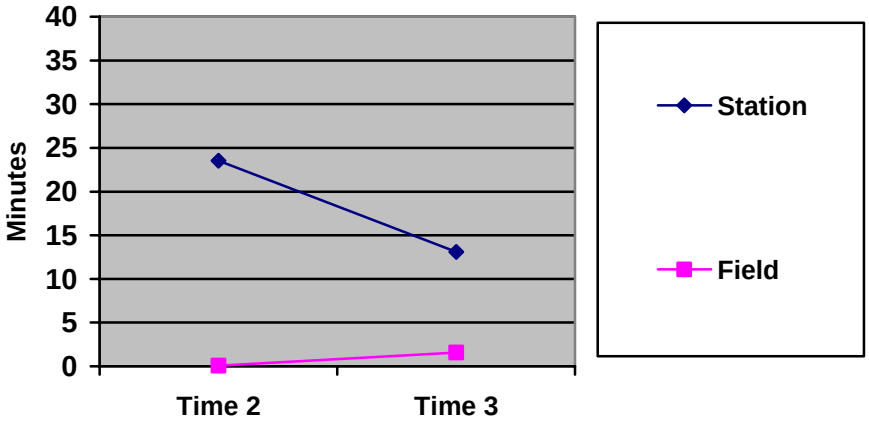

Figure 5d

4-Way Interaction Between Location, Installation Time, Measurement Period, and Time 1 Observation: Time Spent on Computer-written Reports for Group D

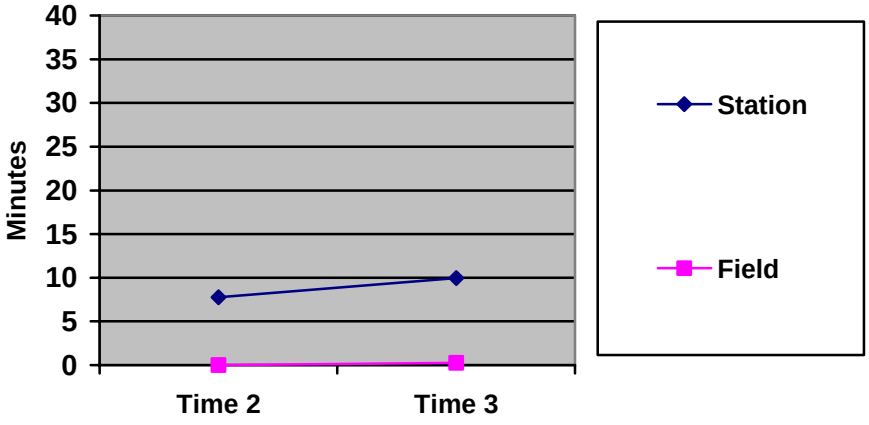

Figure 6a

3-way Interaction Between Installation Time, Measurement Period, and Location: Time Spent on Other Computer Use for Groups A and C (Pre-Time 2 Installation)

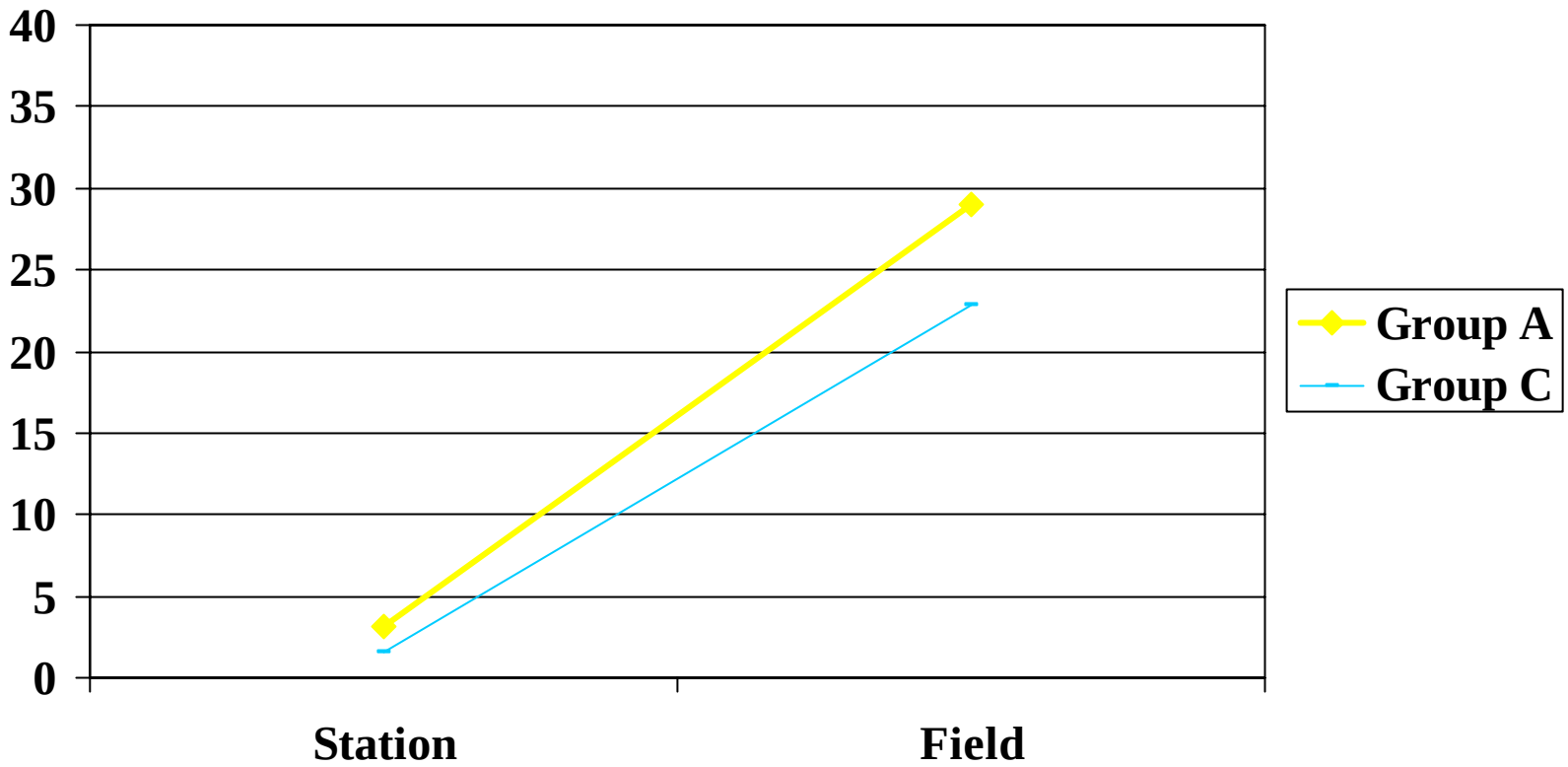

Figure 6b

3-way Interaction Between Installation Time, Time 1 Observation, and Location: Time Spent on Other Computer Use for Groups B and D (Post-Time 2 Installation)

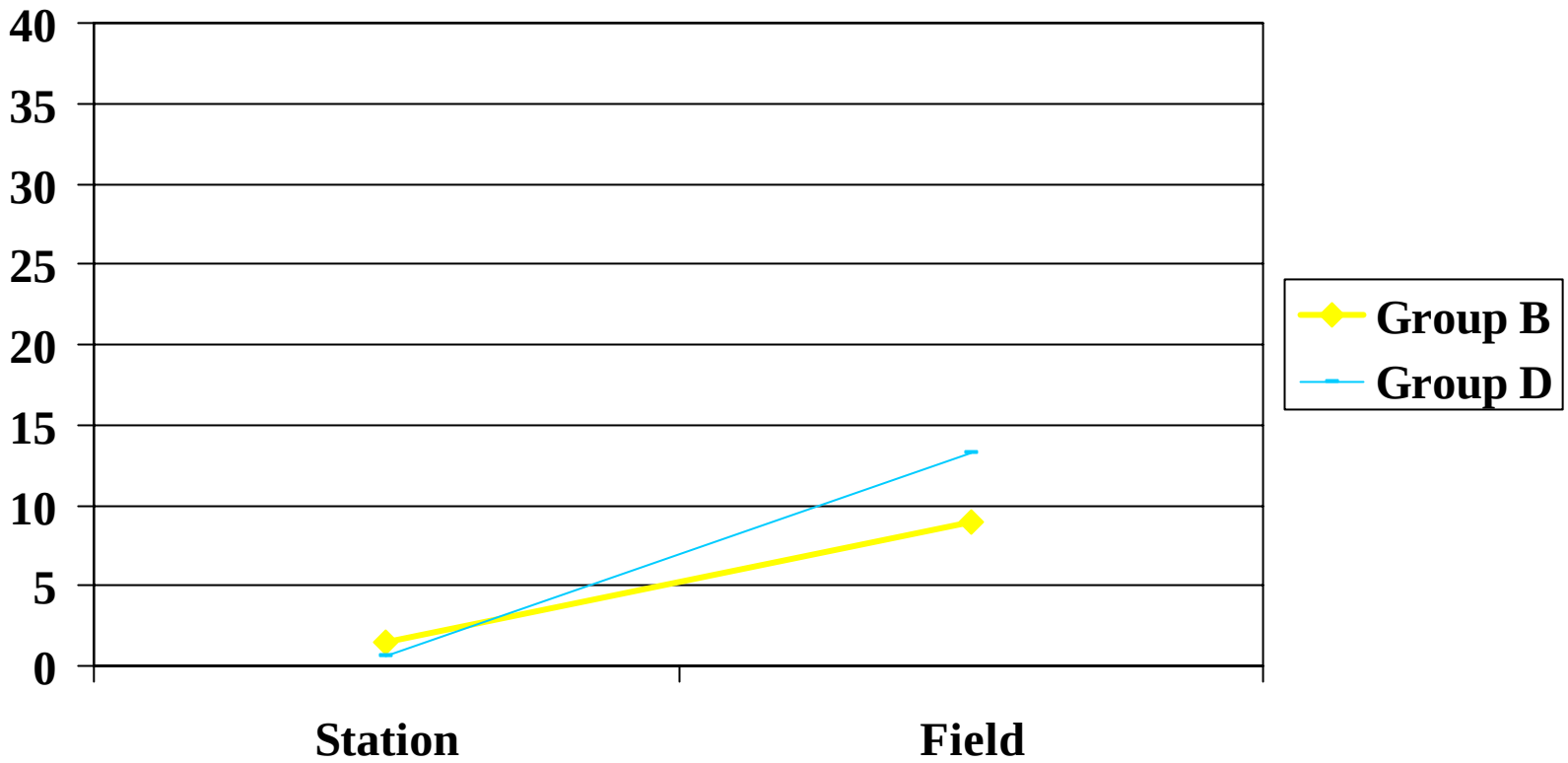

Figure 7a

3-way Interaction Between Measurement Period, Installation Time, and Location: Time Spent on Hand-written Reports for Groups A and C

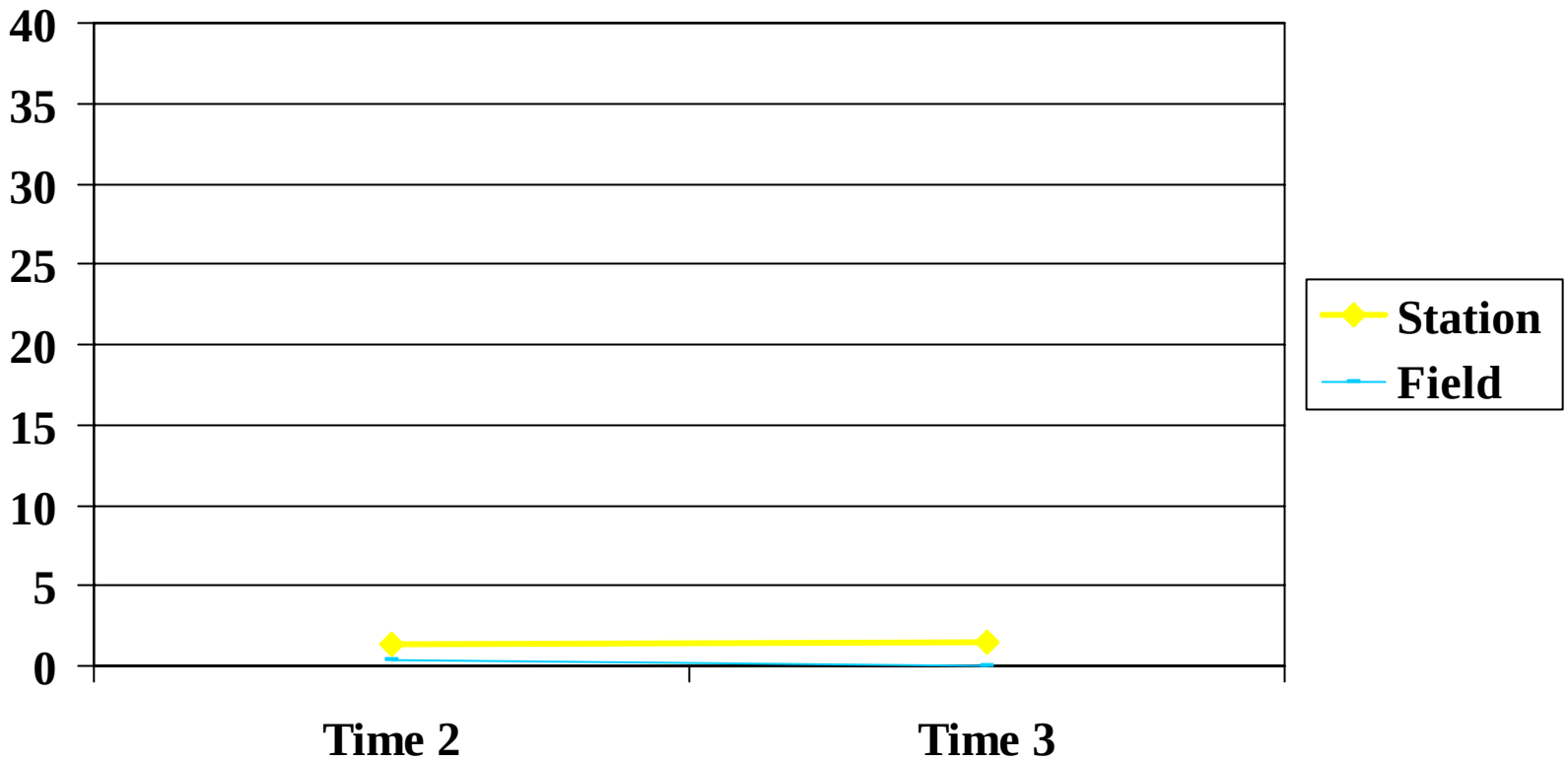

Figure 7b

3-way Interaction Between Measurement Period, Installation Time, and Location: Time Spent on Hand-written Reports for Groups B and D

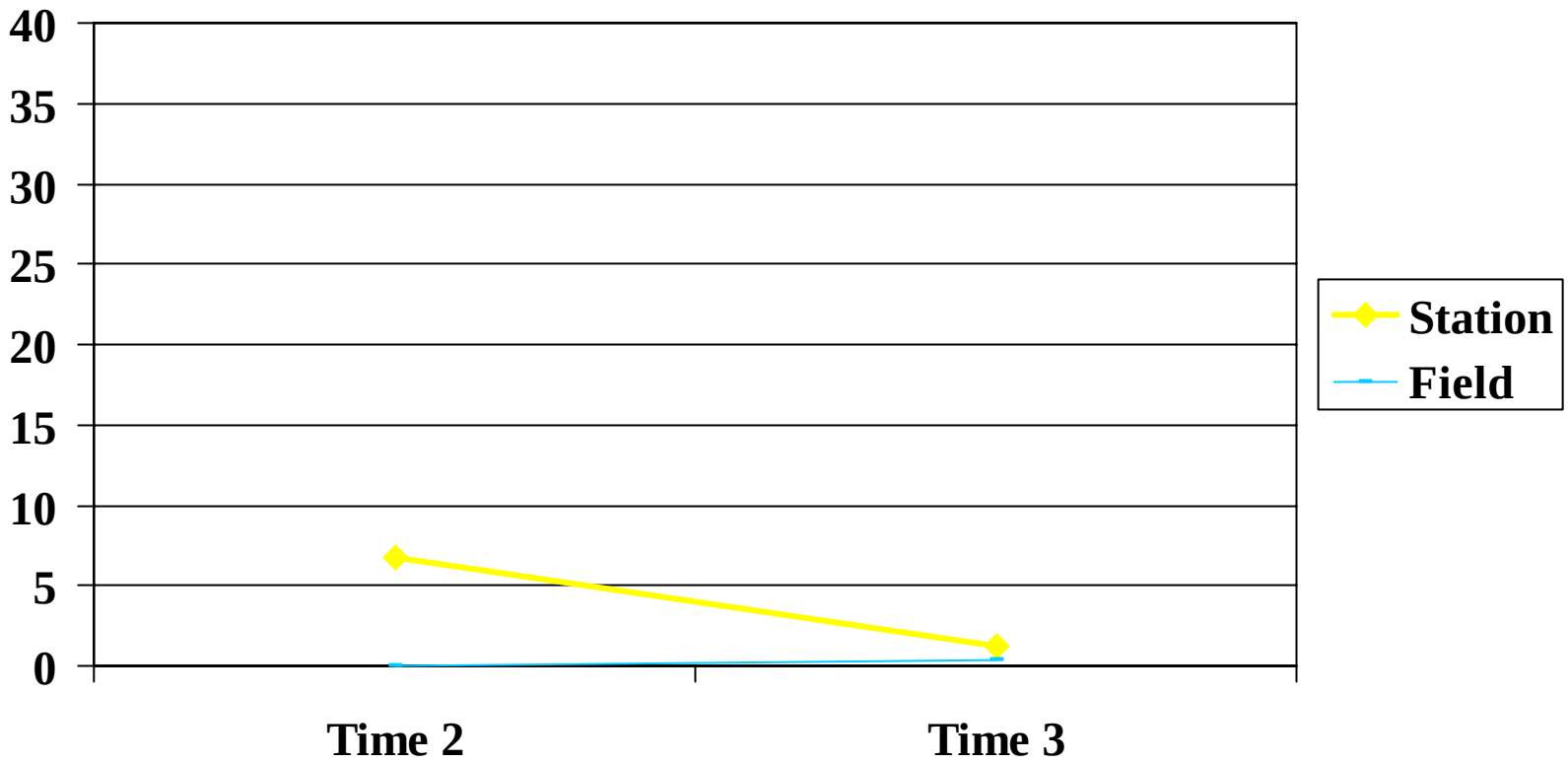

Figure 8

Main Effect of Location for Groups A & B: Total Time Spent

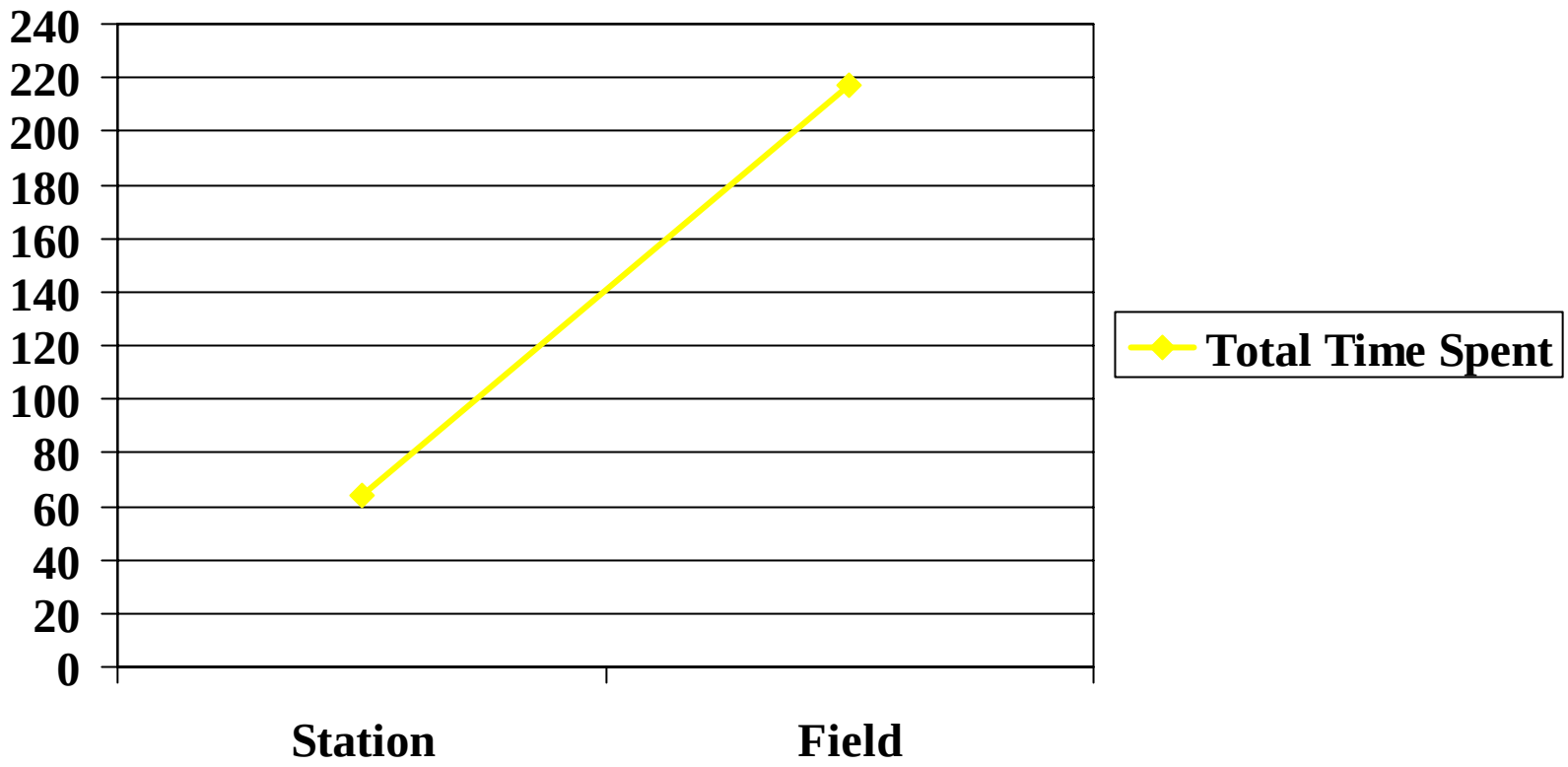

Figure 9

Main Effect of Location for Groups A, B, C, & D: Total Time Spent

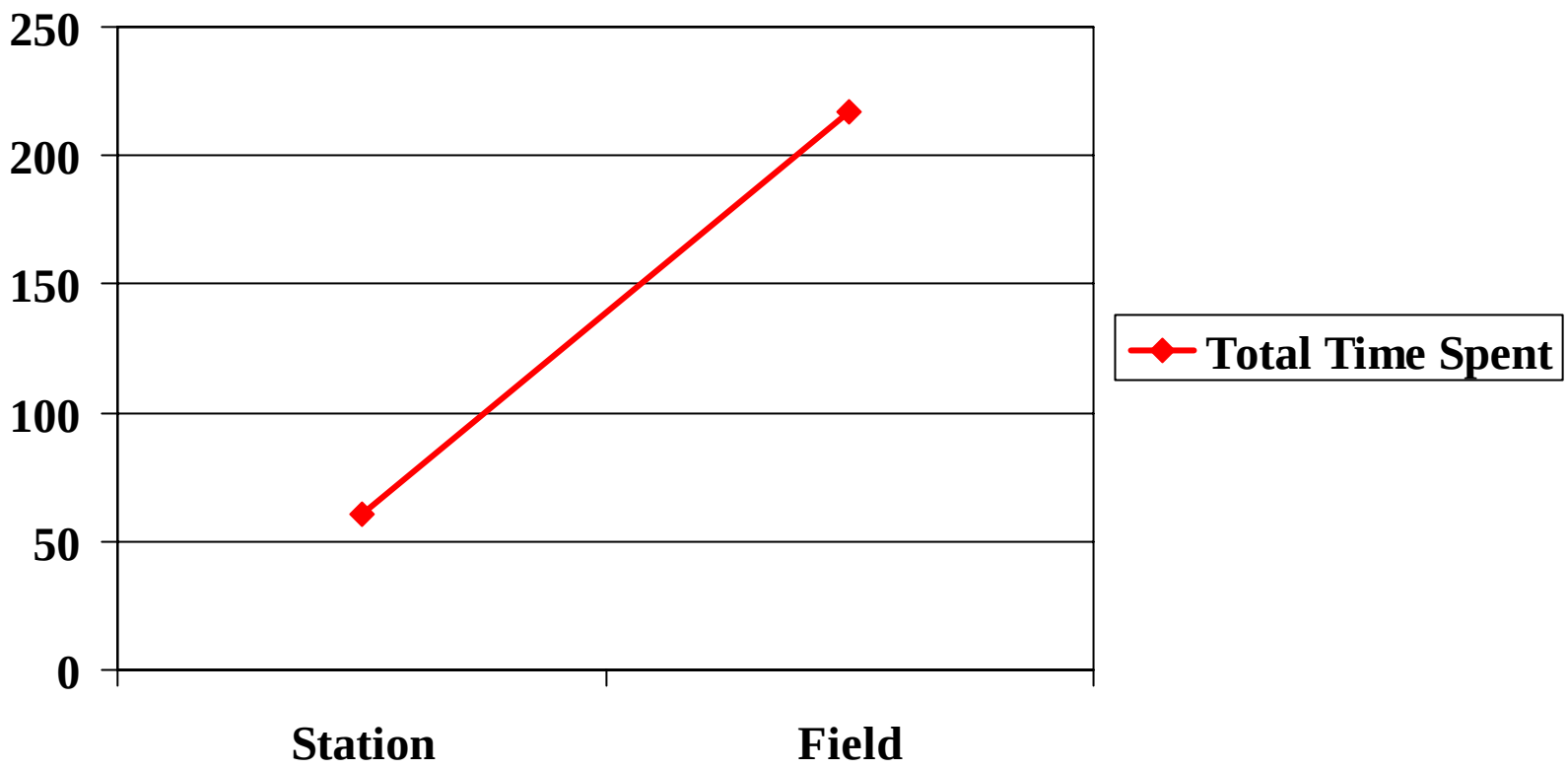

Figure 10a

3-way Interaction Between Installation Time, Measurement Period, and Activity Type for Time Spent:
Group A (Pre-Time 2 Installation)

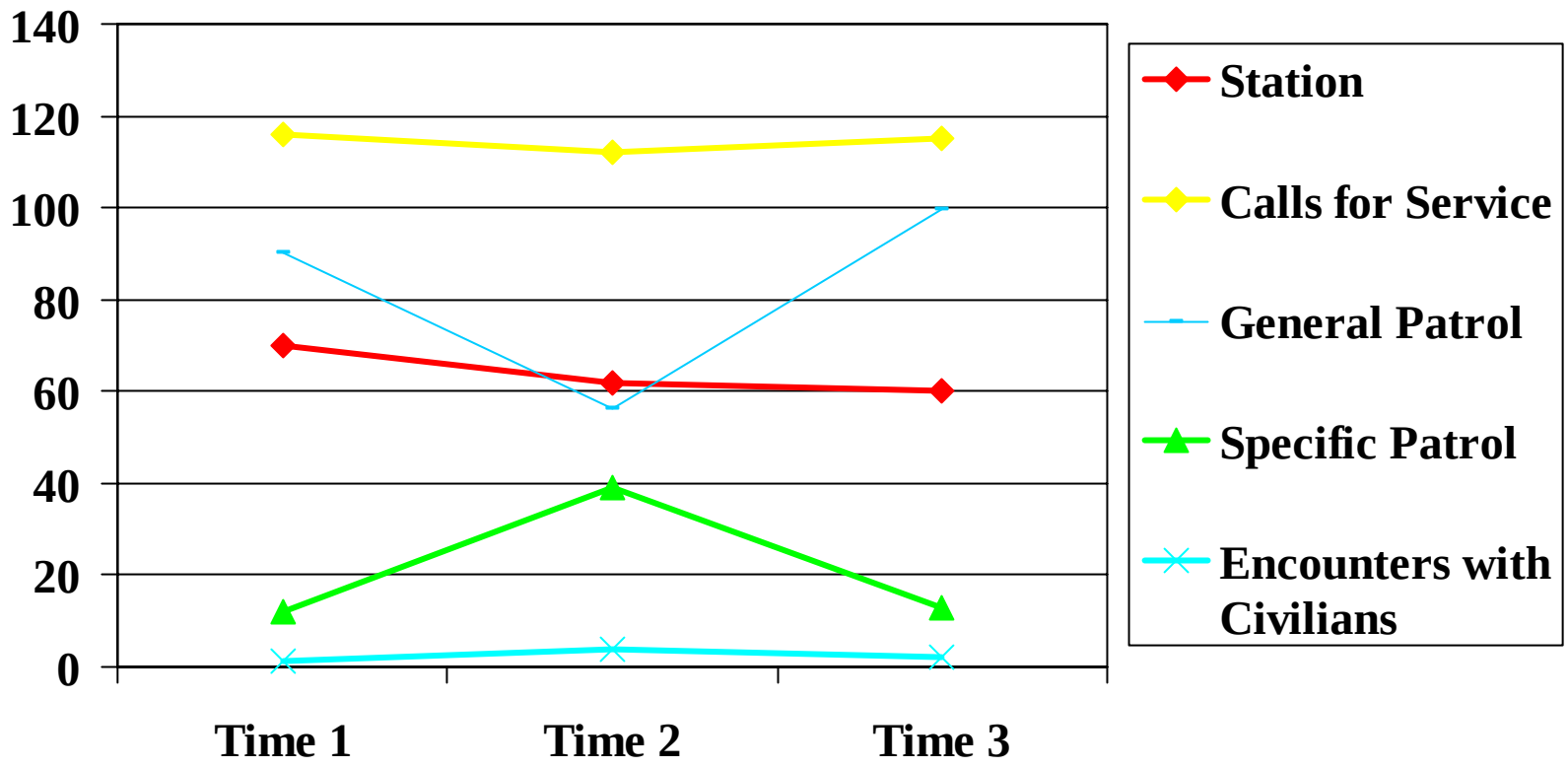

Figure 10b

3-way Interaction Between Installation Time, Measurement Period, and Activity Type for Time Spent:
Group B (Post-Time 2 Installation)

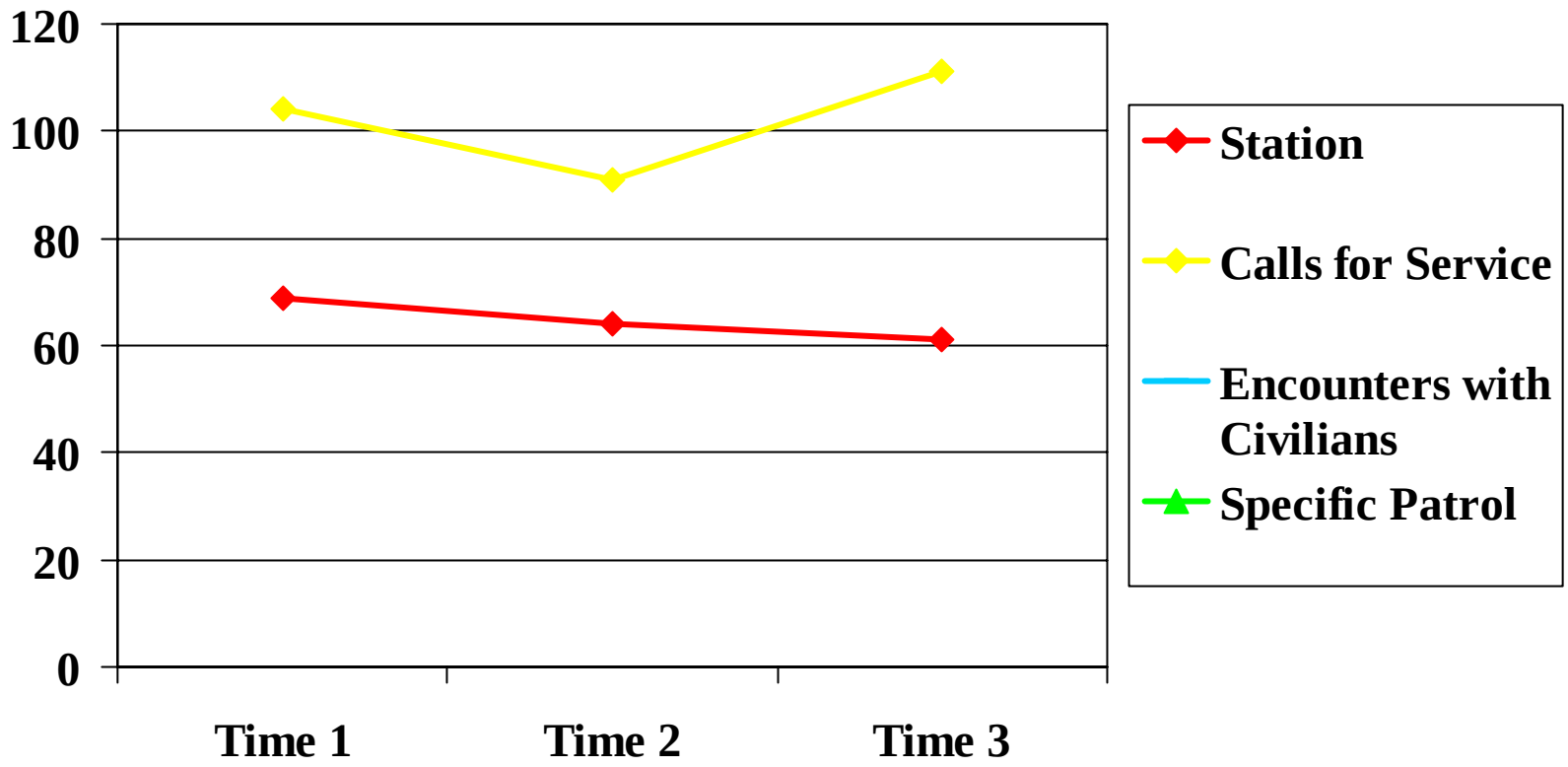

Figure 11a

4-Way Interaction Between Time 1 Observation, Installation Time, Measurement Period, and Activity: Group A (Time 1 Observantion & Pre-Time 2 Installation)

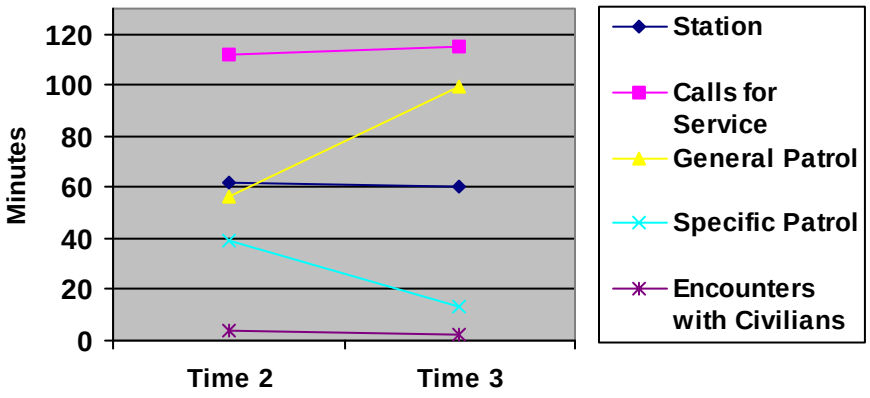

Figure 11b

4-Way Interaction Between Time 1 Observation, Installation Time, Measurement Period, and Activity: Group B (Time 1 Observantion & Post-Time 2 Installation)

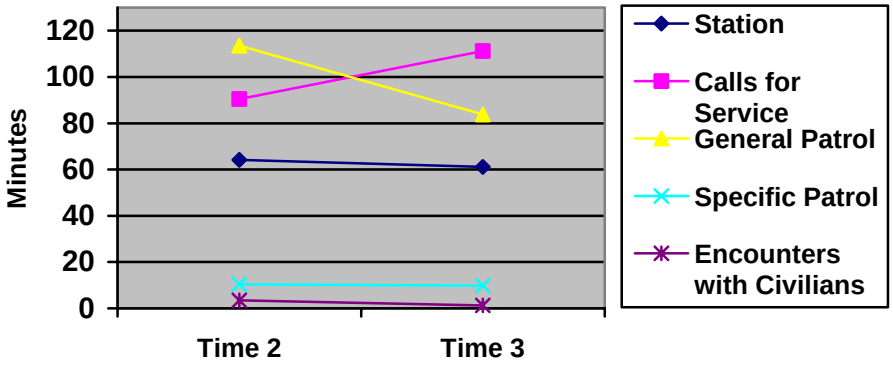

Figure 11c

4-Way Interaction Between Time 1 Observation, Installation Time, Measurement Period, and Activity: Group C (No Time 1 Observantion & Pre-Time 2 Installation)

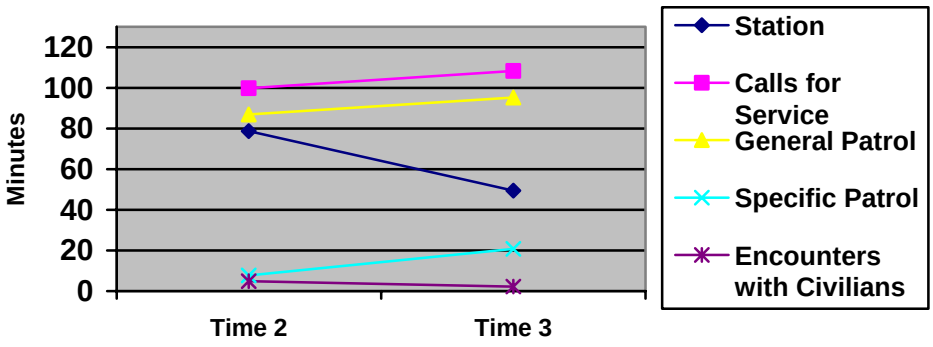

Figure 11d

4-Way Interaction Between Time 1 Observation, Installation Time, Measurement Period, and Activity: Group D (No Time 1 Observantion & Post-Time 2 Installation)

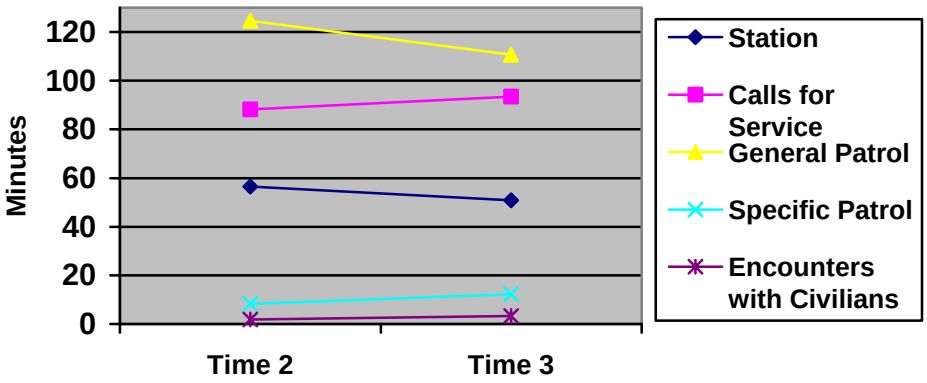

Figure 12

Two-way Interaction Between Community Policing Activity and Measurement Period for Time Spent: Groups A and B

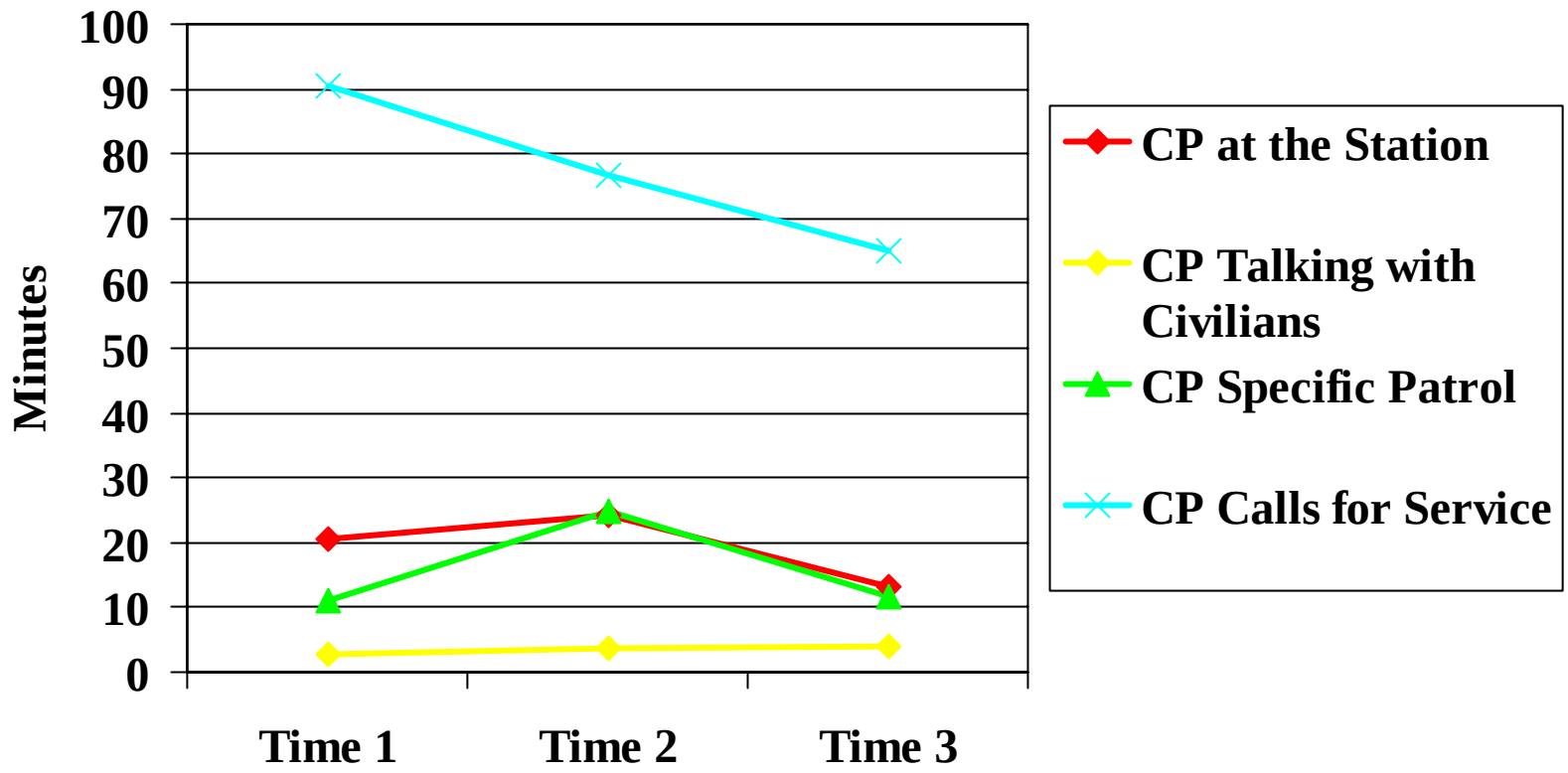

Figure 13a

Three-way Interaction Between Community Policing Activity, Measurement Period, and Installation Time for Time Spent: Groups A and C (Pre-Time 2 Installation)

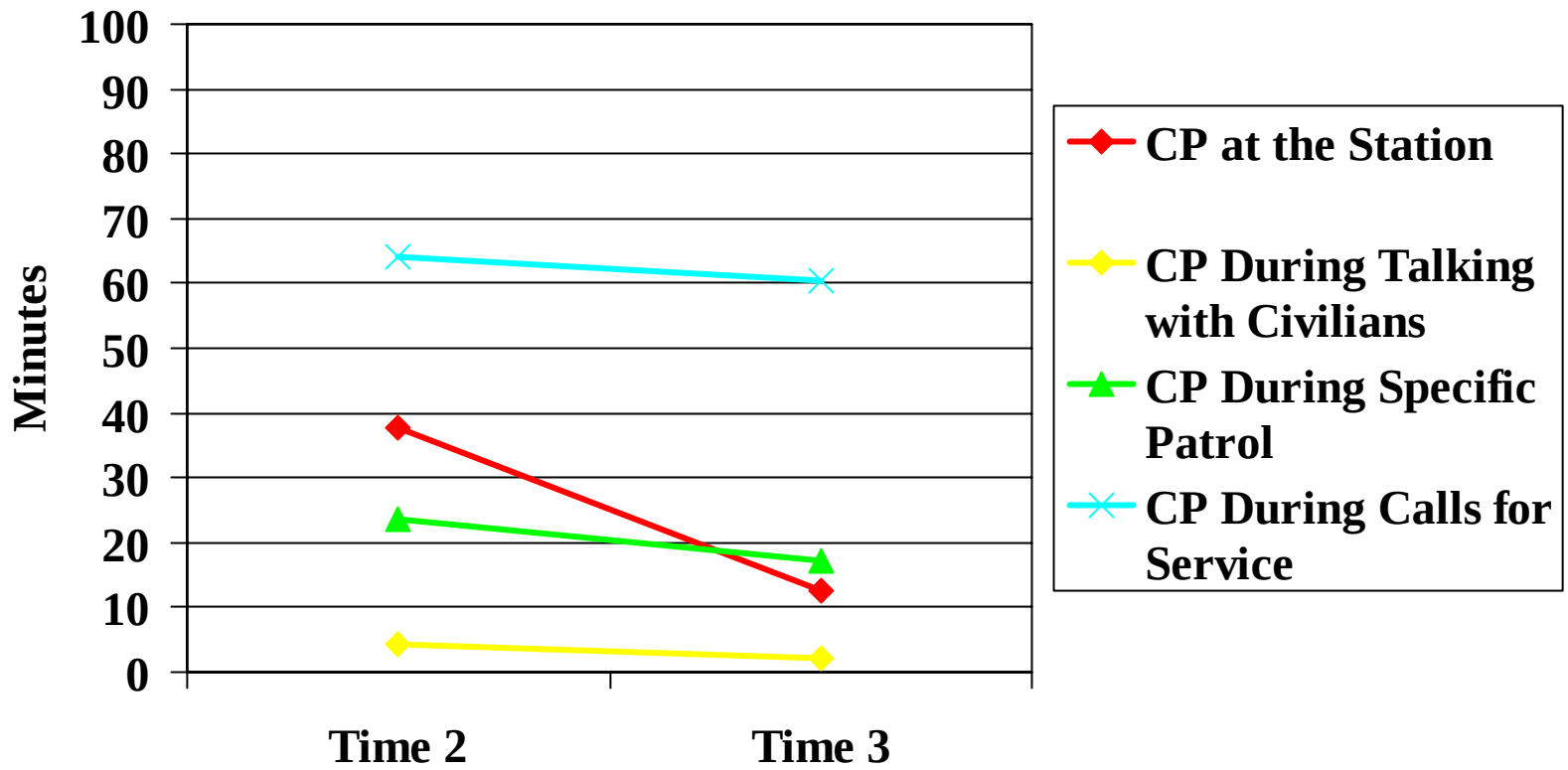

Figure 13b

Three-way Interaction Between Community Policing Activity, Measurement Period, and Installation Time for Time Spent: Groups B and D (Post-Time 2 Installation)

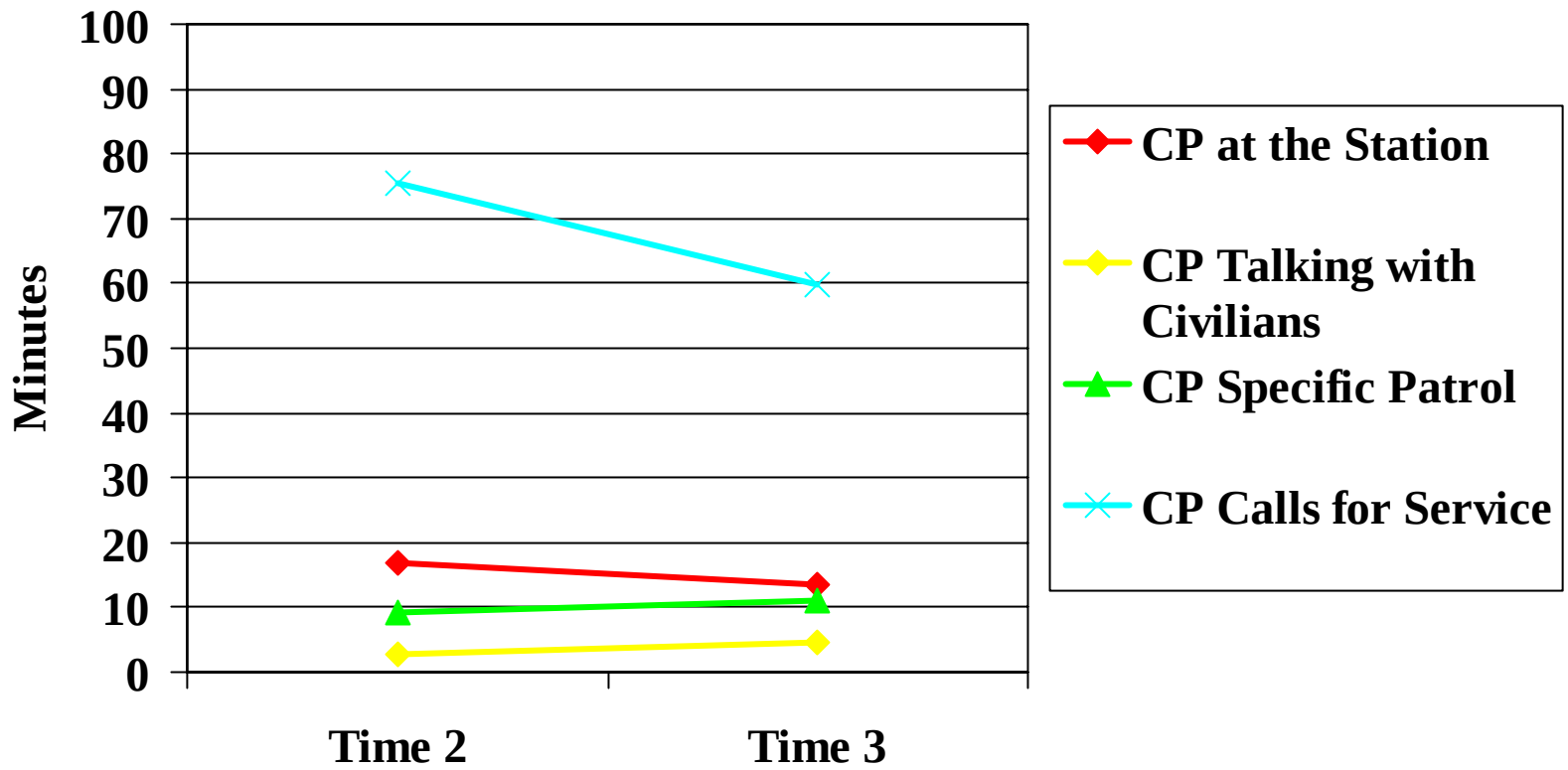

Table 1

Means and SDs of Demographic Information

	TIME 1			TIME 2			TIME 3		
Variable	Mean	Standard Deviation	Sample Size	Mean	Standard Deviation	Sample Size	Mean	Standard Deviation	Sample Size
Hours of training on community policing within the past six months	5.51	11.83	39	9.81	14.7	47	4.66	13.01	83
Number of years using computers	4.95	4.93	39	6.18	5.42	40	4.72	4.95	86

Table 2

Modal Response for Demographic Variables Across Three Measurement Periods

Variable	Time 1	Time 2	Time 3
Age	31 to 35 years (30%)	26 to 30 years (35%)	26 to 30 years (29%)
Tenure	2 to 5 years (42%)	2 to 5 years (31%)	6 to 10 years (39%)
Education	Some college courses (36%)	Some college courses (39%)	Some college courses (38%)
Formal Training in Computers	No formal training (54%)	No formal training (53%)	No formal training (52%)
Gender	Male (81%)	Male (78%)	Male (83%)
Ethnicity	Caucasian (57%)	Caucasian (73%)	Caucasian (55%)

Table 3

Extended Solomon Four-Group Design: Direct Observations and Surveys

	Time 1		Time 2		Time 3
	Observation & Surveys	MCT's	Observation & Surveys	MCT's	Observation & Surveys
Group A	Sept-Oct 1998 (1)*	June-Aug 1999	June-July 2000 (5)		May-July 2001 (9)
Group B	Nov 98-Dec 1998 (2)		Mar-Apr 1999 (4)	Dec 1999-Mar 2000	Nov-Dec 2000 (7)
Group C		Aug-Nov 1999	Aug-Nov 2000 (6)		Aug, Nov-Dec 2001 (10)
Group D			Jan-March 1999 (3)	April-July 2000	Feb-Apr 2001 (8)

*Numbers in parentheses indicate design group.

Table 4

Number of Calls per Service by District and Quarter.

District Station	Quarter 1 January-March	Quarter 2 April-June	Quarter 3 July-September	Quarter 4 October-December
A	19,321	20,070	20,994	22,046
B	19,402	20,207	19,807	20,019
C	15,742	16,587	18,939	21,450
D	25,285	25,523	27,078	26,620
E	23,425	25,874	27,253	27,526
F	16,130	16,431	18,681	20,402
G	14,788	16,754	17,038	16,518
H	18,230	17,595	18,849	19,697
I	13,203	13,595	13,677	14,682
J	10,568	10,919	11,656	11,447

Table 5

Descriptive Statistics of the Dependent and Independent Variables Across Three Time Periods

	TIME 1			TIME 2			TIME 3		
Variable	**Mean**	**Standard Deviation**	**Sample Size**	**Mean**	**Standard Deviation**	**Sample Size**	**Mean**	**Standard Deviation**	**Sample Size**
Total Station Time	69.53	45.82	93	65.00005	50.43	183	55.09	39.69	181
Total Field Time	217.26	52.04	93	213.08	57.64	183	221.27	69.98	181
Time Computer Written Reports at Station	12.20	28.59	94	16.58	34.82	189	9.98	22.78	182
Time Computer Written Reports in Field	N/A	N/A	N/A	.68	5.17	189	.70	5.43	182
Time Other Computer Use at Station	3.62	11.93	94	2.07	5.57	188	1.21	4.38	182
Time Other Computer Use in Field	N/A	N/A	N/A	13.46	23.05	189	24.01	24.94	182
Total Time Calls for Service	110.15	44.87	93	97.46	50.50	183	106.76	52.32	181
Total Time General Patrol	93.48	48.09	93	95.86	56.35	183	97.11	67.03	181
Total Time Specific Patrol	11.08	21.09	93	16.23	32.67	183	14.15	28.61	181
Total Time Encounters with Civilians	2.55	7.84	93	3.52	8.49	183	3.48	8.79	181

	TIME 1			TIME 2			TIME 3		
Variable	**Mean**	**Standard Deviation**	**Sample Size**	**Mean**	**Standard Deviation**	**Sample Size**	**Mean**	**Standard Deviation**	**Sample Size**
CP Elements Station Activity	.69	1.87	93	.63	1.07	182	.31	.69	181
CP Elements Calls for Service	19.31	20.90	98	17.67	23.50	195	14.16	25.27	196
CP Elements Specific Patrol	1.63	2.71	93	1.85	3.33	182	1.46	2.53	181
CP Elements Encounters with Civilians	1.38	5.66	93	1.14	2.69	182	1.04	2.62	181
Survey Ease of Use	20.26	6.37	35	18.04	4.97	48	18.88	4.37	83
Survey Usefulness	12.11	4.06	36	10.92	3.38	49	10.85	3.73	87
Survey Philosophy	10.03	2.17	37	9.44	2.30	48	8.88	2.52	88
Survey Strategy	19.95	3.93	38	19.18	3.47	49	18.77	4.08	82
Survey Tactical	22.16	4.37	38	19.35	5.10	48	17.85	4.18	87
Survey Organizational	23.24	4.51	37	21.53	3.98	47	20.91	4.42	88

Table 6a- Time 1 Correlations

	1.Total Station Time	2.Total Field Time	3.Computer Written Reports Station	4.Computer Written Reports Field	5.Other Comp Use Station	6.Other Comp Use Field	7.Calls for Service	8.General Patrol	9.Specific Patrol	10.Encount with Civilians	11.CP Elements Station	12.CP Elements Calls for Service	13.CP Elements Specific Patrol
1.	1.000	-.718**	.459**	.	.415**	.	-.239*	-.508**	-.100	-.014	.092	-.060	.009
2.		1.000	-.428**	.	-.253*	.	.517**	.516**	.179	.038	-.069	.026	.077
3.			1.000	.	.151	.	-.180	-.235*	-.128	-.043	.026	-.057	-.039
4.				1.000	.	.	.	.	.	.	.	.	.
5.					1.000	.	-.128	-.180	.079	-.061	.230*	.085	.218*
6.						1.000	.	.	.	.	.	.	.
7.							1.000	-.363**	-.016	-.023	-.036	-.036	-.087
8.								1.000	-.214*	-.057	-.082	.003	-.178
9.									1.000	-.099	.111	.051	.806**
10.										1.000	-.048	.222*	-.069
11.											1.000	.846**	.078
12.												1.000	-.038
13.													1.000

	14. CP Elements Encount with Civilians	15.Ease of Use	16.Useful	17.Phil	18.Strat	19.Tac	20.Org						
1.	-.140	-.177	-.269	-.117	.175	.022	-.039						
2.	.278**	-.158	-.080	.183	-.138	.131	.108						
3.	.008	.268	.126	.036	.358*	.260	.303						
4.	.	.	.	.	.	.	.						
5.	-.163	.040	-.142	-.187	.201	-.157	-.087						
6.	.	.	.	.	.	.	.						
7.	.234*	-.188	-.140	.145	.075	.106	.178						
8.	.005	.070	.054	.132	-.187	.018	-.037						
9.	.135	-.102	-.026	-.170	-.062	.076	.017						
10.	.108	.019	.070	-.116	-.017	-.127	-.262						
11.	-.172	.036	-.025	-.069	.079	.096	.020						
12.	-.089	.098	.037	-.107	-.018	-.047	-.128						
13.	.172	-.182	-.115	-.182	.066	.178	.037						
14.	1.00	-.051	.115	.082	-.313	-.075	-.022						
15.		1.00	.817**	-.049	.468**	.085	.354*						
16.			1.00	-.052	.277	-.065	.162						
17				1.00	.251	.608**	.375*						
18.					1.00	.668**	.590**						
19.						1.00	.698**						
20.							1.00						

Table 6b- Time 2 Correlations

	1.Total Station Time	2.Total Field Time	3.Computer Written Reports Station	4.Computer Written Reports Field	5.Other Comp Use Station	6.Other Comp Use Field	7.Calls for Service	8.General Patrol	9.Specific Patrol	10.Encount with Civilians	11.CP Elements Station	12.CP Elements Calls for Service	13.CP Elements Specific Patrol
1.	1.000	-.795**	.673**	-.025	.213**	-.059	-.308**	-.458**	-.121	-.063	.317**	-.018	-.084
2.		1.000	-.610**	.026	-.206**	.027	.499**	.509**	.072	.165*	-.243**	.104	.111
3.			1.000	-.033	.198**	-.098	-.256**	-.346**	-.089	-.015	.205**	.028	-.136
4.				1.000	.012	-.025	.090	-.151*	.146*	.066	.210**	.214**	.210**
5.					1.000	-.069	.054	-.217**	-.081	.007	.251**	-.006	-.086
6.						1.000	.129	-.245**	.247**	.062	.038	.026	.031
7.							1.000	-.293**	-.174*	.053	.038	.034	-.030
8.								1.000	-.358**	-.060	-.413**	-.102	-.223**
9.									1.000	.054	.205**	.148*	.604**
10.										1.000	.078	.643**	.097
11.											1.000	.141	.095
12.												1.000	.254**
13.													1.000

	14. CP Elements Encount with Civilians	15.Ease of Use	16.Useful	17.Phil	18.Strat	19.Tac	20.Org						
1.	-.206**	.154	.010	-.142	-.039	-.175	-.189						
2.	.382**	-.214	-.072	-.046	-.143	-.058	-.106						
3.	-.075	.301*	.153	-.108	.057	-.064	-.072						
4.	-.024	-.129	.075	-.021	-.145	-.015	-.035						
5.	.017	.185	.087	.030	-.267	-.108	.118						
6.	.015	-.061	-.035	.141	.069	.097	-.064						
7.	.410**	-.054	.097	.210	.199	.133	.106						
8.	.007	-.167	-.250	-.260	-.165	-.211	-.187						
9.	.020	-.001	.080	-.029	-.214	-.002	-.082						
10.	.032	-.223	-.177	-.031	-.039	-.070	.057						
11.	-.031	.202	.292*	-.179	-.189	-.087	-.089						
12.	.151*	-.215	-.102	-.204	-.100	-.181	-.161						
13.	.225**	-.017	.069	-.133	-.373**	-.168	-.043						
14.	1.000	.051	.196	.072	-.060	.012	-.130						
15.		1.000	.741**	.033	-.113	.089	.042						
16.			1.00	.195	.067	.218	.122						
17				1.00	.636**	.816**	.757**						
18.					1.00	.696**	.441**						
19.						1.00	.639**						
20.							1.00						

Table 6c- Time 3 Pearson Correlations

	1.Total Station Time	2.Total Field Time	3.Computer Written Reports Station	4.Computer Written Reports Field	5.Other Comp Use Station	6.Other Comp Use Field	7.Calls for Service	8.General Patrol	9.Specific Patrol	10.Encount with Civilians	11.CP Elements Station	12.CP Elements Calls for Service	13.CP Elements Specific Patrol
1.	1.000	-.525**	.417**	-.117	.273**	-.170*	-.219**	-.326**	-.104	-.033	.329**	-.107	-.080
2.		1.000	-.303**	.091	-.153*	.149*	.465**	.655**	.036	.062	-.192**	.088	.103
3.			1.000	-.015	.086	-.094	-.144	-.166*	-.063	-.100	.288**	-.128	-.104
4.				1.000	-.036	-.056	.112	.025	-.049	.019	-.052	.048	-.027
5.					1.000	-.080	-.019	-.205**	.130	.037	.209**	-.011	.077
6.						1.000	.000	.184*	-.069	.005	-.173*	-.010	.065
7.							1.000	-.238**	-.150*	.060	-.090	.030	.079
8.								1.000	-.273**	-.113	-.165*	-.026	-.148*
9.									1.000	-.003	.056	.009	.365**
10.										1.000	.065	.684**	.280**
11.											1.000	-.029	.074
12.												1.000	.342**
13.													1.000

	14. CP Elements Encount with Civilians	15.Ease of Use	16.Useful	17.Phil	18.Strat	19.Tac	20.Org						
1.	-.184*	-.115	-.034	-.174	-.034	-.158	-.120						
2.	.086	.091	.128	.115	.032	.065	.053						
3.	-.088	.043	.066	-.153	.062	-.070	-.057						
4.	-.032	.048	.072	.061	.002	.038	.015						
5.	-.007	.019	-.008	.084	.120	.109	.001						
6.	-.067	-.058	.091	.017	.097	.076	-.097						
7.	.095	.127	.116	-.030	.003	-.052	-.022						
8.	-.010	.127	.144	.180	.139	.225*	.161						
9.	.003	-.234*	-.204	-.103	-.254*	-.247*	-.210						
10.	.162*	-.129	.016	-.011	-.075	-.129	.027						
11.	.056	-.088	-.023	-.149	.206	-.045	.072						
12.	.335**	.025	.097	.114	-.092	-.081	.064						
13.	.270**	-.102	-.169	-.220*	-.249*	-.364**	-.261*						
14.	1.000	.042	-.119	.079	.003	.036	.040						
15.		1.000	.659**	.458**	.359**	.378**	.488**						
16.			1.000	.293**	.421**	.260*	.327**						
17				1.000	.385**	.700**	.570**						
18.					1.000	.686**	.663**						
19.						1.000	.789**						
20.							1.000						

Table 7a. Means of Time Spent on Computer Written Reports in the Station and Field Before and After Laptop Installation for Each Group

Group	Before Installation		Installation Yes/No	After Installation	
	Station	Field		Station	Field
Experimental (A)	12.67	0.00	Yes	15.00	2.58
Control (B)	11.72	0.00	No	20.62	0.00
No Pre-test Experimental (C)	N/A		Yes	23.53	0.00
No Pre-test Control (D)	N/A		No	7.76	0.00

Table 7b. Two-way ANOVA Model of Time 2 Post-test Means Reflecting Difference Between Installation and Pre-test Groups

		Factor A Installation			
		No Installation		Installation	
		Station	Field	Station	Field
	Pre-test Group	15.00	2.58	20.62	0.00
Factor B Pre-test					
	Non-pre-test Group	7.76	0.00	23.53	0.00

Table 8a. Means of Time Spent on Other Computer Use in the Station and Field Before and After Laptop Installation for Each Group

Group	Before Installation		Installation Yes/No	After Installation	
	Station	Field		Station	Field
Experimental (A)	3.25	0.00	Yes	3.04	35.06
Control (B)	4.00	0.00	No	2.24	0.00
No Pre-test Experimental (C)	N/A		Yes	2.33	18.32
No Pre-test Control (D)	N/A		No	.71	0.00

Table 8b. Two-way ANOVA Model of Time 2 Post-test Means Reflecting Difference Between Installation and Pre-test Groups

		Factor A Installation			
		No Installation		Installation	
		Station	Field	Station	Field
	Pre-test Group	2.24	0.00	3.04	35.06
Factor B Pre-test					
	Non-pre-test Group	.71	0.00	2.33	18.32

Table 8c. Within-Subjects ANOVA Summary Table

Source	SS	df	MS	F	Sig.
Location	11585.14	1	11585.14	59.91	.000
Location * Observation	1341.79	1	1341.79	6.94	.009
Location * Installation	14876.47	1	14876.47	76.93	.000
Location * Observation * Installation	1939.87	1	1939.87	10.03	.002
Error	35581.00	184	193.38		

Table 9a. Means of Station Time and Field Time Before and After Laptop Installation for Each Group

Group	Before Installation		Installation Yes/No	After Installation	
	Station	Field		Station	Field
Experimental (A)	70.39	219.16	Yes	61.53	211.36
Control (B)	68.57	215.14	No	64.23	218.02
No Pre-test Experimental (C)	N/A		Yes	78.62	199.27
No Pre-test Control (D)	N/A		No	56.55	222.92

Table 9b. Two-way ANOVA Model of Time 2 Post-test Means Reflecting Difference Between Installation and Pre-test Groups

		Factor A Installation			
		No Installation		Installation	
		Station	Field	Station	Field
	Pre-test Group	64.23	218.02	61.53	211.36
Factor B Pre-test					
	Non-pre-test Group	56.55	222.92	78.62	199.27

Table 9c. Within-Subjects ANOVA Summary Table

Source	SS	df	MS	F	Sig.
Location	1991571.39	1	1991571.39	383.95	.00
Location * Observation	1574.31	1	1574.31	.304	ns
Location * Installation	14099.73	1	14099.73	2.72	ns
Location * Observation * Installation	9951.12	1	9951.12	1.92	ns
Error	928485.72	179	5187.07		

Table 10a. Means of Time Spent on Police Activities Before and After Laptop Installation for Each Group

Group	Before Installation				Installed Yes/No	After Installation			
	Calls for Service	General Patrol	Specific Patrol	Enc With Civilians		Calls for Service	General Patrol	Specific Patrol	Enc with Civilians
Experimental (A)	115.63	90.20	11.90	1.43	Yes	112	56.24	39.24	3.87
Control (B)	104.05	97.14	10.16	3.80	No	90.50	113.59	10.34	3.59
No Pre-test Experimental (C)	N/A	N/A	N/A	N/A	Yes	99.82	86.84	7.71	4.89
No Pre-test Control (D)	N/A	N/A	N/A	N/A	No	88.20	124.59	8.22	1.90

Table 10b. Two-way ANOVA Model of Time 2 Post-test Means Reflecting Difference Between Installation and Pre-test Groups

		Factor A Installation								
		No Installation					Installation			
		Calls for Service	General Patrol	Specific Patrol	Enc With Civilians		Calls for Service	General Patrol	Specific Patrol	Enc With Civilians
	Pre-test Group	90.50	113.59	10.34	3.59		112	56.24	39.24	3.87
Factor B Pre-test										
	Non-pre-test Group	88.20	124.59	8.22	1.90		99.82	86.84	7.71	4.89

Table 10c. Within-Subjects ANOVA Summary Table

Source	SS	df	MS	F	Sig.
Activity	1382563.34	3	460854.45	267.51	.000
Activity * Observation	34938.91	3	11646.30	6.76	.000
Activity * Installation	122476.95	3	40825.65	23.70	.000
Activity * Observation * Installation	14642.44	3	4880.81	2.83	ns
Error	925132.54	537	193.38		

Table 11a. Means of Number of Community Policing Elements Before and After Laptop Installation for Each Group

Group	Before Installation				Installed Yes/No	After Installation			
	Station Activity	Calls for Service	Specific Patrol	Enc With Civilians		Station Activity	Calls for Service	Specific Patrol	Enc with Civilians
Experimental (A)	.94	2.04	1.88	14.55	Yes	1.20	1.38	2.84	18.12
Control (B)	.41	.64	1.36	24.06	No	.23	1.28	1.95	17.77
No Pre-test Experimental (C)	N/A	N/A	N/A	N/A	Yes	.73	.96	.62	19.35
No Pre-test Control (D)	N/A	N/A	N/A	N/A	No	.35	.98	1.96	15.47

Table 11b. Two-way ANOVA Model of Time 2 Post-test Means Reflecting Difference Between Installation and Pre-test Groups

		Factor A Installation								
		No Installation					Installation			
		Station Activity	Calls for Service	Specific Patrol	Enc With Civilians		Station Activity	Calls for Service	Specific Patrol	Enc With Civilians
	Pre-test Group	.23	1.28	1.95	17.77		1.20	1.38	2.84	18.12
Factor B Pre-test										
	Non-pre-test Group	.35	.98	1.96	15.47		.73	.96	.62	19.35

Table 11c. Within-Subjects ANOVA Summary Table

Source	SS	df	MS	F	Sig.
Activity	451351.24	3	150450.41	100.60	.000
Activity * Observation	15867.71	3	5289.24	3.54	ns
Activity * Installation	27660.41	3	9220.14	6.17	.000
Activity * Observation * Installation	8435.39	3	2811.80	1.88	ns
Error	803065.25	537	1495.47		

APPENDIX A

EVALUATION OF INNOVATIVE TECHNOLOGY: IMPLICATIONS FOR THE COMMUNITY POLICING ROLES OF LAW ENFORCEMENT OFFICERS

NATIONAL INSTITUTE OF JUSTICE
PROJECT NUMBER 98-IJ-CX-0012

Caran Colvin, Ph.D., Principal Investigator
San Francisco State University
ccolvin@sfsu.edu

Technology Acceptance Survey Items Based Upon the Logical Method

Item	Factor
Regarding the laptops, they…	
1. are flexible	Ease of Use
6. are easy to use	Ease of Use
7. provide you with information that is easily understood	Ease of Use
9. help you respond to calls for service in a timely manner	Ease of Use
10. help you submit reports in a timely manner	Ease of Use
11. are dependable	Ease of Use
12 are easy to use in restaurants, coffee shops, etc.	Ease of Use
2. provide information you need when you respond to calls for service	Information Usefulness
3. provide accurate information	Information Usefulness
4. provide up-to-date information	Information Usefulness
5. provide you with the exact information you need	Information Usefulness
8. provide you with information quickly	Information Usefulness

Community Policing Survey Items Based Upon the Logical Method

Item	Factor
5. I am an information resource for members of the public on my beat/sector	Philosophical
13. I have knowledge of available community resources	Philosophical
15. I adopt a customer service approach when interacting with the community	Philosophical
22. I value community policing as an essential part of my job	Philosophical
1. I anticipate crime trends on my beat/sector	Strategic
7. I am the crime prevention officer on my beat/sector	Strategic
8. I assume responsibility for crime problems occurring on my beat/sector	Strategic
12. I work the same beat/sector on a permanent basis	Strategic
18. I feel pressured by the demands of community policing	Strategic
21. I am adequately trained in community policing practices	Strategic
23. I am recognized by members of the public on my beat/sector as the neighborhood police officer	Strategic
2. I use innovative solutions to deal with crime problems on my beat/sector	Tactical
3. I establish two way communication with members of the public on my beat/sector	Tactical
4. I encourage members of the public to provide me with beat/sector information	Tactical
9. I work with members of the public to devise special programs to improve the quality of life on my beat/sector	Tactical
11. I ask members of the public on my beat/sector to express their concerns	Tactical
16. I involve members of the public in crime prevention	Tactical
19. I am able to practice community policing and respond to calls for service	Tactical
24. I work cooperatively with members of the public as a team player	Tactical
6. I provide the Department with information about problem conditions and locations on my beat/sector	Organizational
10. I work cooperatively with other officers as a team player	Organizational
14. I am consulted by senior officers regarding the introduction of new community policing programs on my beat.	Organizational
17. I have a say in how I practice community policing on my beat/sector	Organizational
20. I feel senior officers support community policing	Organizational
25. My fellow officers support my community policing efforts	Organizaitonal
26. The Department rewards me for my efforts to practice community policing	Organizational
27. The policies and procedures of the department make it easy for me to practice community policing	Organizational

DISTRICT STATIONS CODE BOOK

Community Policing Dimensions

(1) Developing a knowledge base about criminal activity within the particular community served (e.g., tracking criminal trends)

(2) Internal community building

(3) External community building

(4) Proactive problem solving

TIME CLUSTERS	CP Dimension
I. Station Time (Includes Case Documentation & Other Admin Activities)	
1. Talk with supervisor about police business	2
2. Communicate with other officers about police business (including other SFPD stations, units, etc.)	2
II. Field Time – Talking with Civilians	
1. Initiate conversation on his/her own without apparent request, notification, or command from others.	4
2. Supervisor/administrator (including roll call) led officers to conversation with civilians.	4
3. Civilian (on scene) initiated conversation.	3
4. Attempt to address the concerns of the public.	3
5. Recommend ways the public could deal with the problem in the future.	3
6. Talk about neighborhood problems.	4
7. Indicate or show that they had prior knowledge of this location or area.	1
8. Indicate or show that they had prior knowledge of this (these) individuals.	1
9. Indicate that the problem involved is part of a larger problem, rather than just circumstantial.	4
10. Try to determine the nature/extent/causes of the larger problem.	4
11. Try to prevent the occurrence or recurrence of a problem.	4
12. Communicate with representatives of a citizen organization (e.g., victim advocacy group)	3
13. Communicate with representatives of a other organizations that provide services to the public (e.g., SFGH, homeless shelters).	3
14. Converse about a long-term plan or project to deal with a problem.	4
15. Request input from the supervisor regarding this conversation.	2
16. Notify or summon supervisor.	2
17. Refer civilian to an organization providing services to the public.	3
18. Council/advise/mediate with civilian.	3
19. Give civilian other personal assistance.	3
III. Field Time – Patrol	
1. Try to prevent the occurrence or recurrence of a problem.	4
2. Patrol was part of a long-term plan or project to deal with a problem.	4
3. Indicate that the problem in the patrol is part of a larger problem, rather than just 4. circumstantial.	4

4. Try to determine the nature/extent/causes of the larger problem.	4
5. Initiate *specific patrol* on his/her own without apparent request, notification, or 6. command from others.	4
6. Supervisor/administrator (including roll call) led officers to *specific patrol*.	4
7. Civilian (on scene) led officers to *specific patrol*.	3
8. Indicate or show that they had prior knowledge of this location or area. s*pecific patrol*	1
9. Request input from the supervisor during this patrol.	2
10. Notify or summon supervisor during this patrol.	2

IV. Field Time – Calls for Service

1. Attended to incident on his/her own without apparent request, notification, or command from others.	4
2. Supervisor/administrator (including roll call) led officers to incident.	4
3. Civilian (on scene) led officers to incident.	3
4. Indicate that they had prior knowledge of this location or area.	1
5. Indicate that they had prior knowledge of the suspect/perpetrator.	1
6. Spend time talking with civilians, community leaders, or business owners/employees.	3
7. Attempt to address the concerns of the public (excluding victims).	3
8. Recommend ways that the public could deal with the problem in the future (excluding victims).	4
9. Talk about neighborhood problems.	1
10. Address the concerns of the victim.	3
11. Provide the victim with numbers for social services	3
12. Recommend ways the victim could deal with the problem in the future	3
13. Involve representatives of a citizen organization (e.g., a victim advocacy group, neighborhood crime watch).	3
14. Communicate with representatives of other organizations that provide services to the public (e.g., SFGH, homeless shelters).	3
15. Police tried to prevent the occurrence or recurrence of a problem.	4
16. Incident was part of a long-term plan or project to deal with a problem.	4
17. Indicate that the problem in this incident is part of a larger problem, rather than just circumstantial.	4
18. Try to determine the nature/extent/causes of the larger problem.	4
19. Request input from the supervisor during this incident.	2
20. Notify or summon supervisor during this incident.	2
21. Refer civilian to an organization providing services to the public (excluding victims).	3
22. Counsel/advise/mediate with civilian.	3
23. Give civilian other personal assistance.	3

V. Field Time -- Case Documentation & Other Admin Activities (Computer use in the field).

1. Talk with supervisor about police business.	2
2. Communicate with other SFPD stations, units, etc.	2

VI. Court-Related Activities

1. Build rapport with DA, ADA, etc.	3

PART B

COMPUTER USAGE & REPORT WRITING

I. Non-report writing computer use (in minutes): _____ (Don't forget III. Computer Location)

II. Did use of a computer involve:

1. Accessing local, state, and national databases (e.g., license plates)
2. Messaging between units
3. Unknown computer use
4. Transmission of reports to central repository
5. Access to state penal codes, city ordinances, and Department General Orders
6. Access to premise information and beat information
7. Access to contact information and phone numbers for community referrals
8. Called up case number
9. Pulled and printed details regarding call for service
10. Background check (e.g., Check DL#, pulled up someone's wrap sheet and warrant check)
11. Communication with dispatch regarding calls for service

Other _____

III. Computer location

1. Portable laptop (outside of station; indicate location) _____
2. Portable laptop (inside of station)
3. Desktop at station

Other _____

IV. Hand-written Report time (in minutes) _____

V. Computer Report time (in minutes) _____ (Don't forget III. Computer Location)