Journal of Applied Psychology
1995, Vol. 80, No. 5, 547-564

0021-9010/95/$3.00

Listen While You Work? Quasi-Experimental Relations Between Personal-Stereo Headset Use and Employee Work Responses

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Using a quasi-experimental design, this study examined relations between stereo headset use and employee work responses. Employees ($N = 256$) worked on 32 jobs in an office of a retail organization. Employees indicated whether they were interested in using stereos at work. From those expressing an interest, a random sample ($n = 75$) was assigned to a stereo condition. These employees used headsets at work for 4 weeks. The remaining employees ($n = 181$) were assigned to a control condition and were not allowed to use stereos. Results indicated that employees in the stereo condition exhibited significant improvements in performance, turnover intentions, organization satisfaction, mood states, and other responses. The mood state of relaxation best explained the relation between stereo use and performance. Finally, employees in relatively simple jobs responded most positively to the stereos.

Much of the early research in organizational psychology and behavior focused on the effects of characteristics of the physical environment (e.g., temperature, noise, music, and lighting) on the productivity and the morale of employees (e.g., Luckiesh, 1924; Vernon, 1919; Viteles & Smith, 1946; Wyatt & Langdon, 1937). A noticeable shift away from such research began in the 1950s, and it has only been in recent years that there has been a resurgence of interest in the possible impact of the physical environment on employees' responses (e.g., Duvall-Early & Benedict, 1992; Oldham, Kulik, & Stepina, 1991; Sundstrom, Burt, & Kamp, 1980; Sutton & Rafaeli, 1987; Szilagyi & Holland, 1980). We designed the current study to contribute to this growing literature by examining one element of the environment—music—that has received little attention by organizational behavior researchers in the past 50 years. Specifically, we examined relations between employee work responses and music delivered by a relatively new technology—the personal-stereo headset (e.g., Sony's Walkman).

Little previous research has systematically examined relations between music provided by personal stereos and the productivity and the psychological well-being of employees. However, a number of studies have examined the effects of background music on employee work effectiveness (cf. Gladstones, 1969; Keenan, 1989; Newman, Hunt, & Rhodes, 1956). In this article, we briefly review this literature. We then discuss three theoretical perspectives that might be used to explain the relations between music delivered by personal stereos and employee work responses. Next, we discuss the possibility that the complexity of jobs might influence relations between stereo headset use and employee responses. Finally, we report the results of a quasi-experiment designed to test these ideas and perspectives.

Music and Employee Work Responses

Much of the early research on background music focused on its effects on employee work performance (cf. Burris-Meyer, 1943; Fox & Embrey, 1972; Humes, 1941; "Muzak Theory and Practice," 1959; W. A. S. Smith, 1961; "Sorting Mail to Music," 1922; Wyatt & Langdon, 1937). In general, most of these studies suggested that music has a small positive effect on performance (Sundstrom, 1986). For example, Wyatt and Langdon studied the effects of music on the productivity of factory employees. Results indicated an increase in productivity from 6% to 11% while music was played. A study by H. C. Smith

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We express great appreciation to Carol Kulik and Keith Murnighan for comments on earlier drafts of this article and to Fritz Drasgow for help with analytic planning.

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(1947) examined the effects of background music on the productivity of radio assemblers. Results showed gains in output ranging from 4% to 25%.

In addition to these investigations of the general effects of background music, other studies have examined the effects on productivity of (a) different types of music and (b) the length of music programming. Most systematic examinations have failed to demonstrate consistent superiority for any particular type of music in enhancing employee productivity (Freeburne & Fleischer, 1952; Humes, 1941; McGehee & Gardner, 1949; Newman et al., 1956). For example, Newman et al. contrasted the effects of dance, folk, popular, and show music on the quantity and the quality of worker output and found no differences in output among the four music types. Research has also shown few productivity differences among employees who are exposed continuously to music versus those who are exposed occasionally or intermittently (see Fox, 1971, for a review).

Taken together, these results suggest that any form of music delivered into organizations by background systems has generally positive effects on employees' work performance. However, these analyses have disregarded the potential problems associated with the use of background music in organizations. One of these problems involves the expenses associated with implementing and maintaining such systems. For example, one background-music firm estimated that costs range between $5,000 and $6,000 for introducing a background-music system into a medium-sized office and renting music tapes for 1 year (Muzak Limited Partnership, personal communication, September 1, 1993). A potentially more serious problem involves the resistance of some employees to the use of background music. Muzak Limited Partnership's (1989a) research has indicated that 21% of employees prefer no music to music that is provided by background systems. Other studies also have indicated that many employees find background music annoying (Kerr, 1944; Uhrbock, 1961). Indeed, some individuals have argued that the use of background music is an invasion of their privacy and have carried this objection to the supreme court ("Trapped in a Musical Elevator," 1984). The basic problem is that background-music systems are inflexible and cannot easily accommodate the preferences of some individuals either for no music or for a different type of music than is provided by the system.

Given the potential benefits of music and the limitations of background-music systems, many organizations are now turning to an alternative music-delivery system, the personal-stereo headset (Huber, 1984; Lipman, 1993; Powell, 1994). Headsets are relatively inexpensive (prices start at about $6 per unit), and they allow the individual employee to select both the nature and the length of music programming. Unfortunately, few studies have systematically examined the effects of personal-stereo systems, and the impact of personal stereos on the productivity and the well-being of employees is unclear.

In this study, we addressed this void in the literature by examining relations between personal-stereo use and the performance effectiveness of employees. In addition, we explored the relations between headset use and several other employee responses: turnover intentions and satisfaction with job, coworkers, and organization. In the next section of this article, we present three theoretical perspectives that might explain why music delivered by personal stereos may be related to these work outcomes.

Personal Stereos and Employee Work Responses: Three Theoretical Perspectives

Commentators have long offered a number of plausible explanations for the positive effect of background music on employee work performance. For example, it has been suggested that music enhances performance by reducing fatigue (Cardinell, 1948; Diserens, 1926), reducing nervous tension (Cardinell, 1948; Terry, 1975), increasing relaxation (Terry, 1975; Wylie, 1958), boosting levels of arousal or activation (Sundstrom, 1986), and masking distracting noise (Muzak Limited Partnership, 1988). Unfortunately, most of these explanations have been post hoc. Previous studies have not empirically tested these or related theoretical perspectives for explaining the effects of music, and no study has systematically compared and contrasted them.

In this study, we contrasted the effectiveness of three general perspectives derived from previous research and writing in explaining the relations between music delivered by personal stereos and the work responses of employees. Specifically, we examined the extent to which four employee mood states (i.e., nervousness, relaxation, enthusiasm, and fatigue), perceived environmental distractions, and control over music programming explain the relations between headset use and employees' responses. Each of these general perspectives is discussed below.

The *mood state* perspective suggests that music delivered by personal-stereo systems influences an employee's moods at work, which, in turn, affect his or her work responses. Much of the previous research focusing on mood has characterized it as consisting of two predominant and independent dimensions: positive and negative affect (Brief & Roberson, 1989; Burke, Brief, George, Roberson, & Webster, 1989; George, 1989; Watson & Tellegen, 1985). Positive affect refers to how much a person professes a zest for life; negative affect refers to how upset or unpleasantly aroused a person feels (George, 1989).

Recent work by Burke et al. (1989) has shown that construing and labeling mood in terms of four, rather than two, descriptively unipolar dimensions adds precision to the description of self-reported mood states. Burke et al.'s factor analytic study of a widely used measure of mood, the Job Affect Scale (JAS), indicated that a four-factor model represented an improvement in fit to the data relative to a two-factor model (i.e., positive and negative affect). Interestingly, the four factors—relaxation (low activation), nervousness (negative activation), enthusiasm (positive arousal), and fatigue (low arousal)—that emerged from the Burke et al. study correspond exactly to many of the states discussed by commentators attempting to explain the effects of music (cf. Cardinell, 1948; Terry, 1975).

Although no previous study has systematically examined the effect of music on these four specific mood states, an early study by Middleton, Fay, Kerr, and Amft (1944) did examine the effect of background music on mood at work. They investigated the effects of two types of music, waltz–instrumental and popular–vocal, on individuals' feelings of restfulness–tiredness and pleasantness–unpleasantness. Results indicated that individuals rated themselves as feeling less tired and less unpleasant on days that music was played than they did on days that music was not played. Moods did not differ as a result of differences in music types.

Other studies have established that situational factors, such as gifts, refreshments, room density, and noise, affect individuals' moods (Isen & Levin, 1972; Isen, Means, Patrick, & Nowicki, 1982; Nagar, Pandey, & Paulus, 1988). Moreover, studies have shown that mood states often relate significantly to outcomes such as performance, absenteeism, job satisfaction, turnover intentions, and helping behavior (Brief & Roberson, 1989; George, 1989, 1990; Isen, Daubman, & Nowicki, 1987; Nagar & Pandey, 1987).

A second perspective, labeled *environmental interference,* suggests that personal-stereo use reduces the number of distractions and interruptions an employee experiences at work (Lipman, 1993; Muzak Limited Partnership, 1988). Headsets are expected to have these effects for at least two reasons. First, music delivered by headsets may mask the distracting background noise produced by machines, equipment, and peripheral conversations (Lipman, 1993; Muzak Limited Partnership, 1988). Second, stereo use may decrease the number of unwanted interpersonal interruptions employees experience at work, because headset users are perceived by coworkers as less available for discussion and conversation than nonusers (Huber, 1984; Powell, 1994). By reducing environmental distractions and interruptions in this manner, headsets may allow individuals to focus their attention on the task itself, resulting in enhanced work performance.

Previous research has provided some support for these arguments. Results of a study conducted by Muzak Limited Partnership's (1989b) research department showed that 93% of the employees of one organization reported that music masked other sounds in the work environment. A study by Loewen and Suedfeld (1992) demonstrated that individuals in a masked office-noise condition reported fewer environmental distractions and performed better than those in an unmasked condition. Other research has suggested that when individuals experience few distractions at work, they report higher satisfaction with their job, coworkers, and work unit (Oldham, 1988; Oldham & Rotchford, 1983).

It also might be argued that music itself can be a source of distraction at work (Powell, 1994). However, the little systematic research that has addressed this potential drawback suggests that in most circumstances, music is (a) less distracting than the environmental interruptions it masks and (b) more likely to enhance than to diminish task attention (see Fox, 1971, for a discussion).

Finally, the *music control* perspective argues that the availability of personal-stereo systems provides employees with opportunities to control the nature of music programming at work. These opportunities, not available to those without stereos, are expected to contribute to the satisfaction of individuals' needs for control at work (Greenberger & Strasser, 1986) and, thereby, enhance their work responses.

No previous study has systematically examined the effects of allowing employees to control music programming. However, research has shown that individuals who have greater control over other specific characteristics of their work environment (e.g., lighting, noise, pace, work equipment, and schedules) generally exhibit more positive responses (e.g., higher performance and satisfaction) than do those with little control (cf. Evans & Fischer, 1992; Glass & Singer, 1972; Greenberger, Strasser, Cummings, & Dunham, 1989; Hackman & Oldham, 1976; Schutte, Malouff, Lawrence, Glazer, & Cabrales, 1992).

On the basis of the aforementioned arguments, we predicted the following:

Hypothesis 1: Employees who use stereo headsets will exhibit more positive work outcomes (i.e., higher performance, lower turnover intentions, and higher satisfaction with job, coworkers, and organization) than employees who do not use headsets.

Hypothesis 2: Employees who use stereo headsets will report more positive mood states (i.e., lower nervousness, greater relaxation, greater enthusiasm, and lower fatigue) than employees who do not use headsets, and these mood states will mediate the relations between headset use and work outcomes.

Hypothesis 3: Employees who use stereo headsets will report fewer distractions and interruptions at work than employees who do not use headsets, and these environmental interferences will mediate the relations between headset use and work outcomes.

Hypothesis 4: Employees who use stereo headsets will report more control over music programming than employees who do not use headsets, and this music control will mediate the relations between headset use and work outcomes.

Job Complexity and Employee Responses to Personal Stereos

This study also examined the possibility that the complexity of employees' jobs moderates the relation between music provided by stereo headsets and employees' work responses. Most of the early research on the effects of background music focused on jobs that were simple and routine (Fox, 1971; Sundstrom, 1986). Relatively few studies have examined the effects of music on employees working on complex, high-skill jobs (Fox, 1971; Wexley & Yukl, 1984). In addition, few studies have directly contrasted the effects of music for jobs of varying complexity.

Although little research has examined the impact of job complexity on employee reactions to music, it has been generally assumed that employees holding simple, low-skill jobs respond more positively to music than do employees working on complex, demanding jobs (Fox, 1971; Wexley & Yukl, 1984). The basic argument for this interaction is that employees in complex jobs are more involved or absorbed in their work than those in simple jobs and, therefore, are less likely to attend to and benefit from music in the workplace (Kirkpatrick, 1943; McGehee & Gardner, 1949).

On the basis of this argument, we predicted the following:

Hypothesis 5: Employees in simple, low-skill jobs will respond more positively to using stereo headsets (i.e., higher performance, lower turnover intentions, and higher satisfaction) than will employees working on jobs that are relatively complex.

Summary

This study examined (a) relations between personal-stereo headset use and employee performance and other work outcomes, (b) the effectiveness of several mediators derived from three theoretical perspectives in explaining these relations, and (c) the extent to which job complexity moderates the relations between stereo headset use and employee responses. In addition, we explored relations between music type and length and employee responses. As discussed above, early studies have suggested that the nature and the length of music programming have little impact on employees' responses (cf. Middleton et al., 1944; Newman et al., 1956). However, these issues have been addressed only with background music, not with stereo headsets. Thus, we explored the independent and joint contributions of the type and the length of music programming listened to by personal-stereo users.

Method

Research Setting and Participants

We conducted this study in one business office of a large retail organization. The total size of the office was approximately 31,000 ft^2 (9,448.8 m^2). Data were collected from 256 employees (243 women and 13 men). Employees worked an average of 36 hr per week and held 1 of 32 different jobs (e.g., correspondence, invoice processing, auditor of security videos, and account analysis). The mean organizational tenure level was 8.5 years. The category of education most frequently indicated was "some college experience." The racial composition of the participant group was as follows: American Indian or Alaska Native (2%), Asian or Pacific Islander (0.7%), African American (9.3%), Hispanic (1%), White (80%), and missing (7%). The marital status of the group was as follows: single (22.2%), divorced (12.3%), married (57.9%), and missing (7.6%).

Procedure

We were contacted by the human resources manager of the office and were asked to conduct an evaluation of a "personal-stereo headset intervention." The manager was considering this intervention as a means to improve employees' task concentration and performance effectiveness. We agreed to conduct the evaluation if given substantial input into the design of the research. Management agreed to this condition, and the research began in February 1993.

After consulting with us, management sent a memo to all employees indicating that they were considering allowing a group of employees to use personal stereos at work for a trial period. Employees were asked to cooperate with university researchers involved in the evaluation of this intervention and were assured of confidentiality.

Research Design

In this research, we used a version of the pretest–posttest nonequivalent control group quasi-experimental design (Campbell & Stanley, 1963; Cook, Campbell, & Peracchio, 1990). We assigned individuals to experimental and control groups on the basis of their initial preferences for personal stereos. The specific procedures used to form these groups are described below.

Approximately 2 weeks before stereo headsets were introduced into the office, all office employees ($N = 256$) completed a personal-stereo preference questionnaire. Employees were asked to provide their names and demographic information on this questionnaire. Next, employees were asked to select one of three alternatives concerning their stereo preferences: (a) "own

a personal stereo and would use it at work" (n = 84), (b) "do not own a personal stereo but would use a loaner at work if one were provided" (n = 66), or (c) "would not use a personal stereo at work" (n = 106).

To determine if the individuals in these three groups differed demographically from one another, we conducted a series of one-way analyses of variance (ANOVAs). Results showed no significant differences ($p > .05$) in education, tenure, race, or marital status across the three groups.

Employees who expressed an interest in using personal stereos were then asked to indicate the type of programming they were likely to listen to at work. We generated 17 categories of programming (e.g., country, rap, classical, and other [specify]) and listed them on the questionnaire. Stereo users' listening log sheets, described below, included the most frequently selected categories on this preference questionnaire.

On the basis of the employees' responses to the preference questionnaire, we assigned individuals to experimental conditions. Only individuals indicating a preference for stereos were allowed to use personal-stereo headsets at work. Specifically, a 50% random sample was drawn from each of the aforementioned "own" and "loan" preference groups, creating four separate groups: own–use (n = 42), loan–use (n = 33), own–do not use (n = 42), and loan–do not use (n = 33). Those who preferred not to use a stereo were assigned to a fifth group, would not use (n = 106). We indicated to employees in the own–use group that they had been randomly selected from those interested in stereos and that they would be allowed to use their personal stereos at work for a 4-week trial period, described later in the *Personal-Stereo Intervention and Data Collection Strategy* section. We provided individuals in the loan–use group with personal stereos, and we told them that they had been randomly selected to use these stereos for the same period of time. We told individuals from the own–do not use and loan–do not use groups that a group of employees interested in stereos had been randomly selected to use headsets for a 4-week trial period and that they were not part of that random sample. Individuals from the would not use group were also told that a group of employees interested in personal stereos had been randomly selected to use headsets at work for a 4-week period. No further information about the research design was provided to employees.

Personal-Stereo Intervention and Data Collection Strategy

One week after the stereo preference questionnaire was administered and approximately 1 week before employees were informed of their experimental conditions and stereos were introduced, all employees completed a second questionnaire measuring mood, control over music programming, environmental interferences, turnover intentions, and satisfaction with job, coworkers, and organization. In addition, performance data were obtained for all employees for a prestereo period of 4 weeks prior to the introduction of the stereos. Data collected at this point were considered Time 1 (T1) data.

Approximately 1 week after the second questionnaire was administered, the personal-stereo intervention began. For a 4-week period, individuals in the own–use and loan–use groups were allowed to listen to stereos at work. In-use performance data were collected for all employees during this 4-week trial period. Stereo use was discontinued after this period.

Stereo users completed listening log sheets during the entire 4-week trial period. Every 2 hr, individuals indicated the number of minutes they had used the stereos for that period. They also indicated the type of music they listened to most during each 2-hr period. Employees selected music types from five categories: (a) country, (b) easy listening, (c) oldies, (d) rhythm and blues, and (e) other (specify). The first four categories had been mentioned most frequently on the stereo preference questionnaire, as described in the *Research Design* section.

At the conclusion of the 4-week stereo in-use period, employees completed a third questionnaire that was identical to Questionnaire 2. Data collected at this point were considered Time 2 (T2) data.

Performance data were collected for all employees for a poststereo period of 4 weeks after stereo use had been discontinued. Also, a member of the office's human resources staff rated the complexity of each of the 32 jobs in the office.

Measures

Questionnaire variables were measured on 7-point Likert-type scales, with the exception of the mood states, which were measured on 5-point Likert-type scales. Scale anchors were 1 (*strongly disagree*) and 7 (*strongly agree*) for the environmental interferences, music control, and turnover intentions measures and 1 (*extremely dissatisfied*) and 7 (*extremely satisfied*) for the job, coworker, and organization satisfaction measures. The anchors for the mood state measures were 1 (*very slightly or not at all*) and 5 (*extremely*).

Mood. Each of the four mood states suggested by Burke et al. (1989) was measured with items from the JAS (Brief, Burke, George, Robinson, & Webster, 1988). At the request of management, we shortened the JAS by including a total of 12 items (3 items for each mood state) versus the 20 original JAS items. For each item, employees indicated how they felt at work during the past 4 weeks. Independence among the 12 mood items at T1 was assessed with exploratory factor analysis using principal-components analysis with varimax rotation. Four factors with eigenvalues greater than 1.0 emerged from this analysis, accounting for 69% of the variance. Each of the four factors consisted of items corresponding to the aforementioned mood states. Therefore, the items for each of the four mood states were averaged to form indices. The mood states and the items used to measure them were (a) nervousness: nervous, scornful, hostile (T1 alpha = .66, T2 alpha = .74); (b) relaxation: calm, relaxed, at rest (T1 alpha = .72, T2 alpha = .80); (c) enthusiasm: strong, elated, excited (T1 alpha = .68, T2 alpha = .71); and (d) fatigue: sleepy, drowsy, sluggish (T1 alpha = .87, T2 alpha = .91).

Environmental interferences. Three items suggested by Oldham (1988) were averaged to form an index (T1 alpha = .64, T2 alpha = .66): "While at my workstation, I can work with few distractions or interruptions," "Interruptions at work often prevent me from giving my full attention to my job" (reverse

scored), and "I am able to concentrate fully on my job while at work."

Music control. Two items were averaged to form an index (T1 alpha = .60, T2 alpha = .61): "I have control over the kind of music I listen to at work," and "I have a lot of control over what I listen to at work."

Performance. As indicated above, performance scores were obtained for each employee for three consecutive 4-week periods (pre-, in-use, and poststereo). Supervisors provided us with their weekly performance log sheets for these 12 weeks, which showed each employee's average hourly performance rate. For example, for the invoice-processing job, data were provided indicating the average number of invoices the employee entered into the accounts payable system per hour for a particular week. For the auditor of security videos job, the average number of transactions reviewed per hour by each employee was obtained. Supervisors regularly completed these performance log sheets as part of their normal job responsibilities.

To examine the stability of these performance measures, we calculated correlations among each employee's weekly performance scores for the 4-week prestereo period. Results showed a median correlation of .65, indicating that performance scores were quite stable for the 4-week prestereo period.

Because hourly performance rates differed across the 32 office jobs, employees' performance scores were standardized. To do this, we calculated a mean prestereo performance score for each employee by averaging his or her four weekly performance scores for the prestereo period. We then computed z scores from this mean for each of the 12 weeks of interest. For example, a Week 5 z score was calculated for each employee by subtracting the employee's Week 5 performance score from his or her mean prestereo performance score and then dividing that value by the standard deviation of the mean prestereo score.

We used these standardized performance scores in two ways. First, we contrasted the 12 weekly scores for employees in the stereo and no-stereo conditions. Second, we created overall performance scores for each employee for each of three periods (i.e., pre-, in-use, and poststereo) by averaging his or her 4 weekly standardized scores for those periods. For example, an average in-use stereo score was derived for each employee by averaging his or her standardized scores during the 4-week in-use period. Many of the substantive analyses that follow used this average in-use stereo score as an index of an individual's overall performance while stereos were present in the office.

Turnover intentions. Three items suggested by Colarelli (1984) were averaged to form an index (T1 alpha = .76, T2 alpha = .80): "I frequently think of quitting this job," "I am planning to search for a new job during the next 12 months," and "If I have my own way, I will be working for [the organization] 1 year from now" (reverse scored).

Organization satisfaction. Three items were averaged to form an index (T1 alpha = .83, T2 alpha = .85): "[the organization] in general," "[the organization] as an employer," and "this office of [the organization]."

Job satisfaction. Three items adapted from the "general" and "growth" satisfaction sections of the Job Diagnostic Survey (Hackman & Oldham, 1980) were averaged to form an index (T1 alpha = .84, T2 alpha = .83): "my job in general," "the amount of challenge in my job," and "the kind of work I do in this job."

Coworker satisfaction. Three items adapted from the Minnesota Satisfaction Questionnaire (Weiss, Dawis, England, & Lofquist, 1967) were averaged to form an index (T1 alpha = .77, T2 alpha = .77): "the way my coworkers are easy to make friends with," "the chance to develop close friendships with my coworkers," and "the way my coworkers get along with each other."

Job complexity. A member of the human resources staff who was familiar with all jobs in the office rated each of the jobs on the following two questions: "Overall, how complex is this job?" and "Overall, how much training is required for a person to successfully complete this job?" Both items were measured on 7-point Likert-type scales. Scale anchors were 1 (*not at all complex*) and 7 (*very complex*) for the first item and 1 (*very little training*) and 7 (*a great deal of training*) for the second item. Scores for both items were averaged to form a job complexity index (alpha = .89). The average complexity score for a particular job was then assigned to each employee working on that job. The mean and the standard deviation of this measure were 4.30 and 0.94, respectively.

Results

Relations Among the Measures

Correlations among the measures at T1 and T2 are shown in Table 1. With the exception of the performance result, relations between the identical measures at T1 and T2 (shown along the diagonal in Table 1) were substantial and statistically significant. The T1–T2 correlations involving the outcome measures (e.g., turnover intentions and satisfaction with organization, job, and coworkers) were generally stronger than those involving the mediators (i.e., nervousness, relaxation, enthusiasm, fatigue, environmental interferences, and music control).

Results showed generally low correlations among the six mediators at both T1 and T2. At both times, the strongest correlations among the mediators were those between nervousness–fatigue and relaxation–enthusiasm. The outcome measures were significantly correlated with one another at both T1 and T2, with the exception of performance, which correlated positively and significantly with organization satisfaction at T2 only.

None of the T1 mediators correlated significantly with performance. However, five of the six T1 mediators (all but music control) correlated significantly with at least one of the four remaining outcomes. A similar pattern of results was obtained for the T2 mediators: All except music control correlated significantly with at least one of the outcome measures, whereas only relaxation correlated significantly with performance. Finally, job complexity correlated significantly with only two other measures: nervousness and coworker satisfaction at T1.

Table 1
Correlations Among All Variables at Time 1 (T1) and Time 2 (T2)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Environmental interferences	**.61***	−.25*	.23*	.23*	−.20*	.18*	−.01	−.09	−.12	.22*	.21*	.20*
2. Nervousness	−.24*	**.48***	.30*	−.16*	.51*	−.14*	−.05	−.07	.11	−.20*	−.23*	−.18*
3. Relaxation	.22*	−.30*	**.43***	.41*	−.21*	.21*	−.03	.18*	−.13*	.18*	.11	.16*
4. Enthusiasm	.11	−.05	.32*	**.48***	−.36*	.13*	.06	−.04	−.07	.22*	.18*	.22*
5. Fatigue	−.14*	.26*	.06	−.15*	**.39***	−.16*	−.03	−.11	.03	−.16*	−.22*	−.16*
6. Music control	.03	−.07	.03	.04	−.08	**.26***	.03	.08	.01	.03	.04	.11
7. Job complexity	.04	.15*	−.05	−.02	.04	−.05	—	−.12	.01	−.05	.00	−.10
8. Performance	.11	−.12	.10	−.02	−.12	−.03	−.04	**.07**	.00	.13*	.07	.00
9. Turnover intentions	.02	.16*	−.09	−.24*	.08	.02	.11	.01	**.77***	−.57*	−.47*	−.22*
10. Organization satisfaction	.15*	−.24*	.25*	.33*	.08	.03	−.07	−.06	−.56*	**.73***	.53*	.30*
11. Job satisfaction	.22*	−.13*	.14*	.22*	−.17*	.04	−.03	.07	−.36*	.47*	**.79***	.31*
12. Coworker satisfaction	.13*	−.26*	.24*	.14*	−.03	.10	−.19*	.08	−.25*	.33*	.28*	**.73***

Note. T1 correlations appear below the diagonal, and T2 correlations appear above the diagonal. Correlations between identical measures at T1 and T2 appear in boldface along the diagonal. T1 performance reflects average prestereo performance; T2 performance reflects average in-use performance.
* $p < .05$.

Equivalence of Experimental and Control Groups

As indicated previously, individuals were assigned to one of five personal-stereo groups: own–use, loan–use, own–do not use, loan–do not use, and would not use. To test for equivalence, we conducted a series of one-way ANOVAs on the T1 measures. Results showed no significant differences ($p > .05$), indicating that individuals in all groups exhibited similar responses prior to the personal-stereo intervention. Next, two separate contrasts were conducted for the T2 measures: (a) between the own–use and loan–use groups and (b) between the own–do not use, loan–do not use, and would not use groups. Once again, these contrasts yielded no statistically significant differences ($p > .05$).

These results indicated few differences in the responses of individuals in the stereo groups (own–use and loan–use) and in the no-stereo groups (own–do not use, loan–do not use, and would not use). As a result, the own–use and loan–use groups were combined to form a stereo group ($n = 75$). The remaining three groups were then combined to form a control group ($n = 181$). The resulting two groups were contrasted in many of the analyses reported below.

Relations Between Employee Responses and Music Type and Duration

Employees in the stereo condition were allowed to listen to any type of programming for any length of time during their work shifts. Analysis of the listening log sheets indicated that across all 4 weeks during which stereos were used in the organization, oldies were listened to most frequently by 35% of the stereo group, country by 33%, easy listening by 16%, and other (rhythm and blues, classical, new age, etc.) by 16%.[1] Individuals in the stereo condition used headsets each day for the entire 4-week period. The average number of hours per week listened to any music type was 19.9.

To examine the independent and joint contributions of music type and duration to employee responses at T2, we conducted a series of two-way ANOVAs. In these analyses, the music type listened to most by an individual during the 4-week experimental period was crossed with the actual time he or she listened to that music type. For purposes of these analyses, minutes listened were split at the median to form *high* and *low* minutes groups. These groups were then crossed with the four music types described above. Average in-use performance and each of the questionnaire measures at T2 were the dependent variables.

Results showed no significant ($p > .05$) main effects or interactions involving music type or duration on employee performance or any of the remaining measures obtained at T2. These results suggest that the type of music listened to and the amount of time spent listening to that music type have little relation to employees' moods, productivity, turnover intentions, or satisfaction.

To further explore the possible contributions of music programming, we calculated the number of occasions individuals shifted from one music type to another during the 4-week in-use period. Shifting from any music type to "off" was also counted as a shift. The number of shifts ranged from 0 to 57 with a median of 12. The number of shifts was then correlated with average in-use performance and the questionnaire measures at T2.

[1] When two or fewer people listened to a particular music type, they were collapsed into the *other* category.

Results showed no significant correlations, suggesting that shifting music types during work had little relation to employee responses. These preliminary analyses suggest that individuals in the stereo group exhibited similar responses regardless of their listening habits. Thus, all members of the stereo group were considered equivalent in the substantive analyses reported below.

Relations Between Personal-Stereo Use and Employee Work Responses

To examine the relation between personal-stereo use and the performance effectiveness of employees, we contrasted the weekly performance scores of individuals in the stereo and control groups. Consistent with Hypothesis 1, we expected (a) no significant between-groups differences for the prestereo period, (b) significantly higher performance scores for the stereo group during the in-use stereo period, and (c) no significant between-groups differences for the poststereo period. Performance scores for the stereo and control groups for the entire 12-week period are shown graphically in Figure 1.

An examination of Figure 1 provides general support for Hypothesis 1. There appear to be few differences in the performance of employees in the stereo and control groups for the pre- and poststereo periods but substantial differences during the in-use period. Moreover, the performance of individuals in the control group remained relatively flat over the entire 12 weeks, whereas there was an obvious increase in performance for the stereo group for the 4-week in-use period.

We conducted two analyses to empirically test these differences. First, to examine differences in performance between groups for the entire 12-week period, we used a Hotelling's T^2 test. Results of this test were significant, $F(12, 243) = 2.20$, $p < .05$, indicating that the performance of the stereo and control groups differed over the course of the study. Next, paired t tests were conducted between groups for each of the 12 weeks. Results were generally consistent with expectations. Statistically significant differences ($p < .05$) between groups were observed for each of the 4 weeks for the in-use period. Differences between groups for the remaining 8 weeks were nonsignificant ($p > .05$), with the exception of Week 3 in the prestereo period, where a statistically significant difference was obtained, $t(254) = 2.11$, $p < .05$. Taken together, these results suggest that personal stereos made the hypothesized contribution to work performance—employees using stereos performed at significantly higher levels than individuals not using stereos for each of the 4 weeks that stereos were present in the organization. Details of the results described above are available on request from the authors.

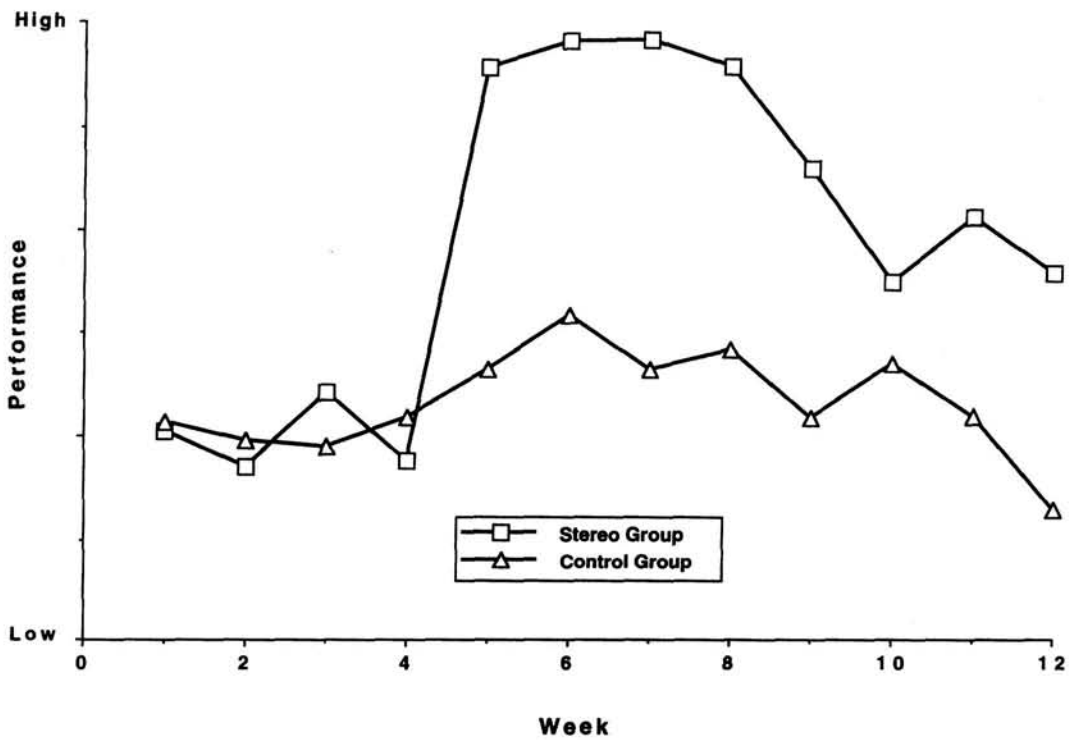

Figure 1. Weekly performance scores of individuals in the stereo and control groups.

To examine the relation between personal-stereo use and all employee responses, we conducted a 2 (stereo vs. control condition) × 2 (T1 vs. T2) multivariate analysis of variance with repeated measures across the last variable. For performance, the T1 score was average prestereo performance and the T2 score was average in-use performance. If personal stereos are related as expected to the outcomes and the mediators (Hypotheses 1–4), a significant Condition × Time interaction should be observed. Results showed significant main effects for both stereo condition, $F(1, 254) = 3.18$, $p < .05$, and time, $F(1, 254) = 4.44$, $p < .05$, as well as the expected Condition × Time interaction, $F(1, 254) = 4.64$, $p < .05$.

Next, we conducted 2 (stereo vs. control condition) × 2 (T1 vs. T2) repeated measures ANOVAs for each of the outcomes and the mediators. Table 2 summarizes these results. Findings involving the five outcome measures were mixed, and they provided only partial support for Hypothesis 1. Specifically, results showed the expected significant Condition × Time interactions for performance, turnover intentions, and organization satisfaction but no significant interactions for job and coworker satisfaction. Effect sizes for the significant interactions ranged from .02 (turnover intentions) to .03 (performance and organization satisfaction).

Results involving the six proposed mediators were fully consistent with Hypotheses 2–4. Significant Condition × Time interactions were observed for the four mood states, environmental interferences, and music control. Effect sizes for these interactions ranged from .02 (environmental interferences) to .12 (relaxation).

Mean comparisons were used to interpret the significant interactions reported above. Mean values for the stereo and control groups at T1 and T2 are shown in Table 3. If personal stereos are related to employee responses as expected, the most positive responses should be observed for employees who used stereos for the 4-week trial period (i.e., those in the T2 stereo condition). In general, the pattern of results shown in Table 3 provided support for our predictions. Specifically, consistent with Hypoth-

Table 2
Summary of Two-Way Analyses of Variance for Mediators and Outcomes

Variable	Source	F	η^2
Nervousness	Experimental condition (E)	0.96	.00
	Time (T)	21.40*	.08
	E × T	12.07*	.05
Relaxation	E	8.65*	.03
	T	40.71*	.14
	E × T	34.81*	.12
Enthusiasm	E	4.26*	.02
	T	1.33	.00
	E × T	6.55*	.03
Fatigue	E	3.51	.01
	T	2.97	.01
	E × T	21.65*	.08
Environmental interferences	E	2.18	.01
	T	3.79*	.02
	E × T	3.79*	.02
Music control	E	10.00*	.04
	T	1.36	.01
	E × T	10.97*	.04
Performance	E	3.95*	.03
	T	8.68*	.07
	E × T	4.22*	.03
Turnover intentions	E	0.00	.00
	T	0.45	.00
	E × T	4.08*	.02
Organization satisfaction	E	0.51	.00
	T	6.49*	.03
	E × T	7.19*	.03
Job satisfaction	E	0.19	.00
	T	0.03	.00
	E × T	0.62	.00
Coworker satisfaction	E	4.20*	.02
	T	0.51	.00
	E × T	1.89	.01

Note. For all F tests, $df = 1, 254$.
* $p < .05$.

Table 3
Mediator and Outcome Means and Standard Deviations for Stereo and Control Groups at Time 1 and Time 2

	Time 1		Time 2		
Variable and group	*M*	*SD*	*M*	*SD*	*t* test
Nervousness					
Stereo	2.01	0.88	1.54	0.71	4.55*
Control	1.91	0.83	1.84	0.85	1.10
t test	0.83		2.81*		
Relaxation					
Stereo	2.21	0.80	2.96	0.90	6.14*
Control	2.27	0.80	2.30	0.86	0.50
t test	0.85		5.39*		
Enthusiasm					
Stereo	2.52	0.73	2.74	0.81	1.95*
Control	2.47	0.80	2.39	0.80	1.41
t test	0.41		3.09*		
Fatigue					
Stereo	2.06	1.08	1.58	0.68	3.90*
Control	1.93	0.87	2.15	1.13	2.75*
t test	0.55		4.20*		
Environmental interferences					
Stereo	3.81	1.18	4.09	1.19	2.35*
Control	3.74	1.21	3.74	1.08	0.00
t test	0.53		2.64*		
Music control					
Stereo	2.23	1.83	2.84	2.28	1.97*
Control	2.12	1.40	1.83	1.25	2.44*
t test	0.52		4.58*		
Performance					
Stereo	−0.01	0.07	1.83	4.29	2.94*
Control	0.01	0.09	0.34	3.78	0.76
t test	1.70		2.02*		
Turnover intentions					
Stereo	2.73	1.31	2.53	1.33	1.95*
Control	2.63	1.37	2.63	1.32	0.00
t test	0.71		0.44		
Organization satisfaction					
Stereo	4.69	1.29	5.02	1.12	3.05*
Control	4.96	1.23	4.96	1.20	0.00
t test	1.82		0.28		
Job satisfaction					
Stereo	5.05	1.41	5.01	1.24	0.69
Control	5.08	1.24	5.13	1.19	0.89
t test	0.23		0.75		
Coworker satisfaction					
Stereo	4.35	1.19	4.39	1.04	0.40
Control	4.70	1.15	4.61	1.09	1.90
t test	2.14*		1.25		

Note. Across Time 1 and Time 2, $df = 74$ for the t tests for the stereo group, and $df = 180$ for the t tests for the control group. Within both Time 1 and Time 2, $df = 254$ for the t tests across groups.
* $p < .05$.

esis 1, the lowest value for turnover intentions and the highest scores for performance and organization satisfaction were observed for the stereo group at T2. For each of these outcomes, there was a significant difference between the T1–T2 scores for the stereo group. However, the difference between the T2 means for the stereo and control groups was statistically significant only for performance, $t(254) = 2.02$, $p < .05$.

Table 3 also shows the mean scores for the mediating variables. Consistent with Hypotheses 2–4, the lowest fatigue and nervousness scores and the highest relaxation, enthusiasm, environmental interferences, and music control scores were observed for the stereo group at T2. Moreover, for each of these mediators, there was a significant difference between the T1–T2 scores for the stereo group. Furthermore, the differences between the T2 means for the stereo and control groups were statistically significant across all six mediators.

In addition to the aforementioned results that are consistent with Hypotheses 2–4, Table 3 also shows a few unexpected findings. As noted earlier, the stereo group did not report higher job and coworker satisfaction after the introduction of headsets. Furthermore, at T1, individuals in the control group expressed significantly higher coworker satisfaction than employees in the stereo group. Finally, two mediators changed unexpectedly between T1 and T2 for employees in the control group: Individuals experienced greater fatigue and lower control over music programming at T2 than at T1.

Mediating Effects of Mood, Environmental Interferences, and Music Control

We predicted (Hypotheses 2–4) that the four mood states, environmental interferences, and music control would mediate the relations between stereo use and the outcome measures. James and Brett (1984) argued that three conditions must be met if a variable is to be considered effective as a mediator: (a) The independent variable must have a significant impact on the mediator, (b) the mediator must have a significant impact on the outcome, and (c) when the influence of the mediator is held constant, the effect of the independent variable on the outcome should be nonsignificant. In addition, if a given mediator is to be considered more effective than other mediators in explaining an outcome, then when the influence of that mediator is held constant, there should be a nonsignificant effect of the remaining five mediators on the outcome.

The personal-stereo intervention made a statistically significant contribution to three outcomes: performance, turnover intentions, and organization satisfaction (see Table 2). Thus, we examined the relative effectiveness of the six proposed mediators in explaining these significant relations.

Table 2 shows that James and Brett's (1984) aforementioned Condition a was met for all of the proposed mediators: enthusiasm, fatigue, relaxation, nervousness, environmental interferences, and music control. Therefore, we conducted hierarchical regression analyses to examine the remaining conditions. In these analyses, the dependent variables were average in-use performance, T2 organization satisfaction, and T2 turnover intentions. To control for individual differences, we entered the score of each outcome measure obtained at T1 (i.e., prestereo performance, T1 organization satisfaction, and T1 turnover intentions) into the regression equation first. This was followed by one of the T2 mediators (fatigue, relaxation, etc.), the set of five remaining T2 mediators, and finally, a dummy-coded variable distinguishing the stereo and control groups. If a mediator is effective relative to other mediators, its introduction into the regression equation should result in a significant increase in the multiple correlation squared for a given outcome, the remaining five mediators in a following step should result in a nonsignificant increase in the multiple correlation squared for that outcome, and the final stereo dummy-coded step should result in a nonsignificant increase in the multiple correlation squared. Results are shown in Table 4.

Results provided mixed support for the hypotheses and indicated that the six proposed mediators differed in their effectiveness in explaining relations between personal-stereo use and employee responses. As shown in Table 4, the variable that was clearly most effective in explaining relations between stereo use and performance was the relaxation mood state. This measure alone contributed significantly to performance. Moreover, after relaxation had been entered into the equation, both the five remaining mediators and the stereo dummy-coded variable made nonsignificant contributions to performance.

Four of the mediators (i.e., nervousness, relaxation, environmental interferences, and music control) were effective in explaining the relations between stereo use and turnover intentions. Each of these mediators contributed significantly to the turnover measure, and after that mediator had been included in the equation, the remaining five mediators and the stereo dummy-coded variable failed to contribute significantly to turnover intentions.

Finally, both relaxation and environmental interferences contributed significantly to the organization satisfaction outcome. However, environmental interferences can be considered the most effective mediator here, because entering the remaining five mediators in the regression equation contributed significantly to organization satisfaction after relaxation had been entered into the equation, but not after environmental interferences had been entered.

The analyses reported above examined the relative effectiveness of the six mediators in explaining the relations between headset use and the outcome measures. However, because all six mediators were always included in the regression equations prior to the introduction of the stereo dummy-coded variable, it is not clear that any one mediator accounted for the relations between headset use and responses. To examine this and to supplement the results provided in Table 4, we conducted additional hierarchical regression analyses in which only three variables were entered into the equations: the T1 outcome, one mediator, and the stereo dummy-coded variable. If a mediator is effective, then including the stereo dummy-coded variable in the equation after the mediator should result in a nonsignificant contribution to the outcome. Results were very similar to those reported in Table 4:

Table 4
Hierarchical Regression Analysis of Mediating Effects of Four Mood States, Environmental Interferences, and Music Control

Mediator	Average in-use performance		Turnover intentions		Organization satisfaction	
	R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2
Nervousness						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 nervousness	.01	.01	.60*	.01*	.54*	.01
T2 other 5 mediators	.09	.08	.62*	.02	.57*	.03*
Stereo dummy	.11	.02	.62*	.00	.57*	.00
Relaxation						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 relaxation	.04*	.04*	.60*	.01*	.55*	.02*
T2 other 5 mediators	.09	.05	.62*	.02	.57*	.02*
Stereo dummy	.11	.02	.62*	.00	.57*	.00
Enthusiasm						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 enthusiasm	.00	.00	.59*	.00	.53*	.00
T2 other 5 mediators	.09	.09	.62*	.03*	.57*	.04*
Stereo dummy	.11	.02	.62*	.00	.57*	.00
Fatigue						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 fatigue	.01	.01	.60*	.01	.54*	.01
T2 other 5 mediators	.09	.08	.62*	.02	.57*	.03*
Stereo dummy	.11	.02	.62*	.00	.57*	.00
Environmental interferences						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 interferences	.01	.01	.60*	.01*	.56*	.03*
T2 other 5 mediators	.09	.08	.62*	.02	.57*	.01
Stereo dummy	.11	.02	.62*	.00	.57*	.00
Music control						
T1 outcome	.00	.00	.59*	.59*	.53*	.53*
T2 music control	.01	.01	.61*	.02*	.54*	.01
T2 other 5 mediators	.09	.08	.62*	.01	.57*	.03*
Stereo dummy	.11	.02	.62*	.00	.57*	.00

Note. T1 = Time 1; T2 = Time 2.
* $p < .05$.

Relaxation alone was effective in explaining the relation involving performance; both environmental interferences and relaxation were effective in explaining the relation involving organization satisfaction; and nervousness, relaxation, environmental interferences, and music control were effective in explaining the relation involving turnover intentions. Details of these results are available on request from the authors.

Job Complexity and Employee Responses to Stereo Headsets

We predicted (Hypothesis 5) that employees in simple jobs would respond more positively to personal stereos than would employees working in jobs that were relatively complex. To test this hypothesis, we conducted additional hierarchical regression analyses. The dependent variables were the average in-use performance score and the outcome measures obtained at T2. To control for individual differences, the score of the dependent variable measured at T1 was entered first, followed by the job complexity score, the stereo dummy, and finally, the Stereo Dummy × Job Complexity interaction term. If the interaction term significantly increased the multiple correlation squared, this would suggest that job complexity moderated the relation between headset use and employee responses.

Results provided partial support for Hypothesis 5. Significant contributions were observed for two of the outcome measures: performance and organization satisfaction. Results indicated that the Stereo Dummy × Job Complexity interaction term increased the multiple correlation squared (R^2) for the measure of performance from .05 to .08, $F(1, 252) = 3.82$, $p < .05$, with an F of 3.21 ($df = 3, 252$; $p < .05$) for the overall equation. The interaction term also increased the R^2 for the measure of satisfaction from .59 to .61, $F(1, 252) = 7.38$, $p < .05$, with an F of 49.81 ($df = 3, 252$; $p < .05$) for the overall equation.

To interpret these results, we conducted separate re-

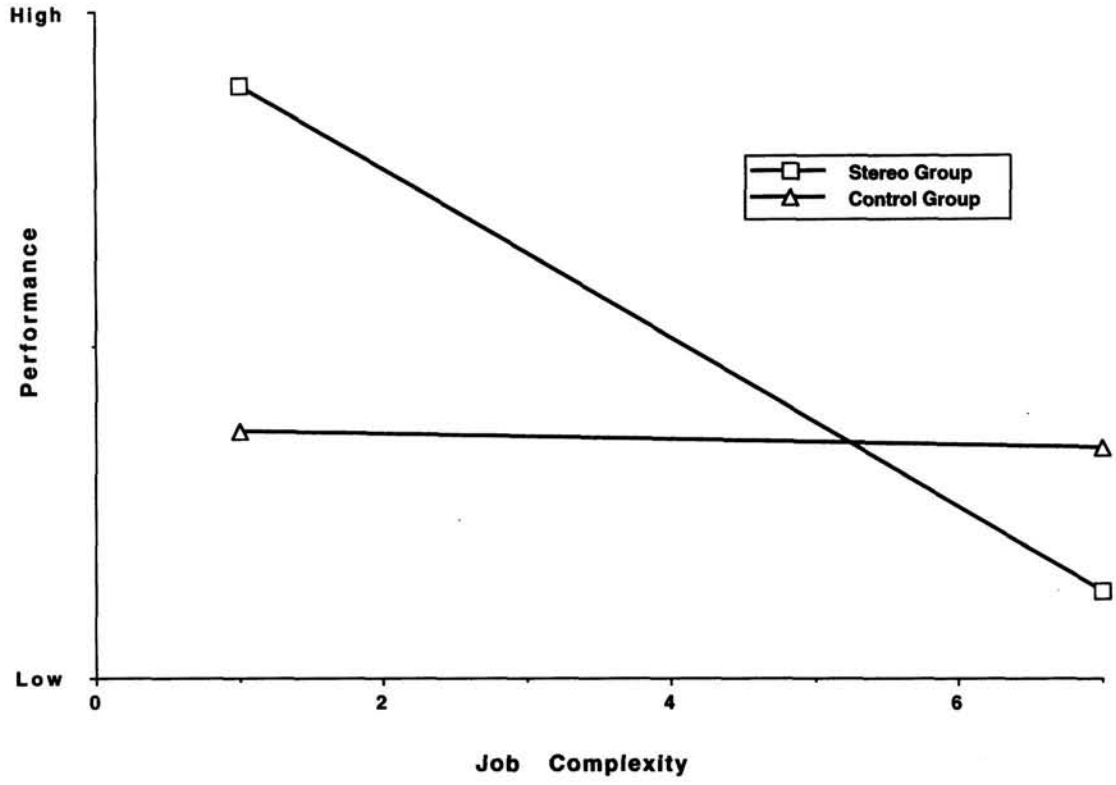

Figure 2. Stereo Condition × Job Complexity interaction for performance. For job complexity, lower scores indicate less complexity, and higher scores indicate more complexity.

gression analyses for the stereo and control groups. The within-groups regression equations were then plotted by using the unstandardized regression coefficients (Peters, O'Connor, & Wise, 1984). Results for performance are shown in Figure 2; results for organization satisfaction are shown in Figure 3.

Results for the measure of performance were consistent with expectations. For the control group, the job complexity measure had little relation to employee performance. However, for the stereo group, job complexity had a strong association: the less complex the job, the higher the average performance. As job complexity increased, performance dropped substantially.

A similar pattern of results emerged for the measure of organization satisfaction (Figure 3). For the control group, there was a slight positive relation between job complexity and organization satisfaction. However, for members of the stereo group, the lower the job complexity was, the higher the organization satisfaction was.

Discussion

Using a quasi-experimental design, we examined relations between personal-stereo headset use and employees' performance and other work outcomes. In addition, we contrasted several mediating conditions that might explain the relations between headset use and these outcomes. Finally, we examined the extent to which job complexity moderated relations between headset use and the outcomes.

All employees participating in the study indicated whether they were interested in using personal stereos at work. A random sample of employees was drawn from those expressing an interest in using stereos. These participants were assigned to a quasi-experimental stereo condition and were allowed to use stereo headsets at work. The remaining employees were assigned to a control condition and were not allowed to use stereos. Results indicated that employees in the stereo condition exhibited generally positive responses to the use of headsets. Specifically, stereo users exhibited significant increases in work performance and organization satisfaction and significant decreases in turnover intentions during a 4-week experimental period in which stereos were present in the office. Alternatively, employees in the no-stereo control group showed no changes in these outcomes during the same 4-week period.

This study also examined the relative effectiveness of

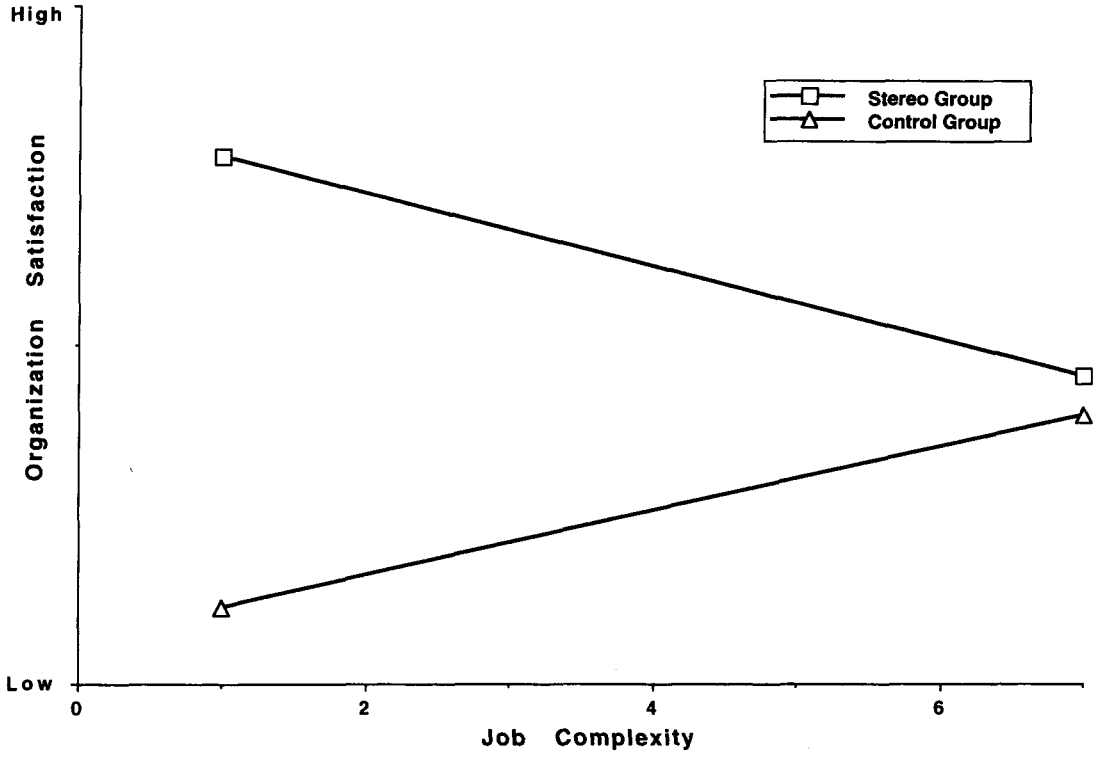

Figure 3. Stereo Condition × Job Complexity interaction for organization satisfaction. For job complexity, lower scores indicate less complexity, and higher scores indicate more complexity.

four mood states (nervousness, relaxation, enthusiasm, and fatigue), perceived environmental interferences, and control over music programming in explaining the relations between headset use and work outcomes. Results indicated that these mediating conditions differed in their effectiveness in explaining the relations between headset use and outcomes. The mood state of relaxation was most effective in explaining the relation between stereo use and performance, whereas environmental interferences were most effective in explaining the relation between stereo use and organization satisfaction. Finally, four of the mediators (i.e., relaxation, nervousness, environmental interferences, and music control) were all effective in explaining the relation between stereo use and turnover intentions.

The results suggesting that stereo use reduced environmental interferences, which then contributed to lower turnover intentions and higher organization satisfaction, are consistent with previous research concerning the value of environmental features that serve as sound-masking devices (Loewen & Suedfeld, 1992; Oldham, 1988). However, reduced environmental interferences did not explain the relation between stereo use and work performance. Furthermore, several of the other mediating conditions examined (e.g., music control and enthusiasm) were also ineffective in explaining performance as well as one or more of the other work outcomes. One explanation for these results involves the reliabilities of the scales used to measure the mediators. The reliabilities of some of these measures were quite low (e.g., .71 for T2 enthusiasm, .66 for T2 environmental interferences, and .61 for T2 music control), which may have influenced their relative effectiveness in explaining the relations between stereo use and work outcomes. Research is now needed to develop more reliable measures of these mediators and to determine if this enhanced reliability improves the extent to which the mediators explain relations between headset use and work outcomes.

An alternative explanation for our mixed mediation results is simply that different mediating conditions are relevant for different outcomes. For example, stereo use may have boosted organization satisfaction by masking environmental distractions but may have increased performance by enhancing employee relaxation at work. This interpretation is consistent with our results and with the positions of earlier commentators interested in the effects of music on employee responses (cf. Cardinell, 1948; Diserens, 1926; Terry, 1975; Wylie, 1958). Re-

search is needed that examines (a) the relations between headset use and other work outcomes (e.g., absenteeism and tardiness) and (b) the specific mediating conditions that explain these relations.

The significant mediating results involving the mood states of relaxation and nervousness contribute to a growing body of research showing the significance of mood for explaining a variety of employee work outcomes (cf. Brief & Roberson, 1989; George, 1989, 1990; Staw & Barsade, 1993). Our results extend the mood literature in two ways by showing (a) that music provided by headsets is significantly related to employee mood states and (b) the value of examining specific mood states (e.g., relaxation) versus the general states of positive and negative affect. Research is now needed to investigate whether specific mood states mediate relations between other features of the physical environment (e.g., density, lighting, and temperature) and employees' work responses.

Research is also needed that directly contrasts the effects of personal-stereo systems with other auditory systems designed to mask distractions or enhance mood. For example, research that compares the effects of simple earplugs, white-noise headset systems (i.e., which provide noise with a wide frequency range that is uniformly distributed throughout a sound spectrum), pink-noise headset systems (i.e., which provide noise whose intensity is inversely proportional to frequency over a specified range), personal-stereo systems, and background-music systems on the performance and the attitudes of employees may provide a number of insights into the appropriate design of sound systems in organizations. This research should address not only which system is most effective in enhancing employees' personal and work outcomes but also which mediating conditions (e.g., mood states and environmental interferences) are most responsible for explaining these effects.

Results of this study demonstrated that job complexity moderated the relations between personal-stereo headset use and employee responses. Stereo users who worked on simple jobs exhibited higher levels of performance and satisfaction with the organization that permitted the headsets than did employees who worked on jobs that were relatively complex. These results are consistent with the position of many commentators who have argued that music is more effective for individuals working on simple jobs than for those working on complex jobs (Fox, 1971; Wexley & Yukl, 1984). On the one hand, music provided by personal stereos may effectively counteract the boredom and the monotony individuals experience on simple jobs, resulting in increased performance effectiveness. On the other hand, music may be a source of distraction for individuals in complex jobs and may actually contribute to lower performance and organization satisfaction (see Figures 2 and 3).

These results suggest that the complexity of jobs should be carefully evaluated before stereo headsets are introduced into an organization. If jobs are simple, headsets may be an effective intervention. However, if jobs are complex and challenging, headsets may have less than desirable effects. Research is needed that examines the impact of other job characteristics and conditions (e.g., required interpersonal interaction) on employee responses to music provided by stereo headsets. It may be, for example, that headsets have positive effects only when individuals perform relatively simple jobs requiring little interaction with others. However, when jobs require substantial interaction with coworkers or clients (e.g., jobs in self-managing work teams), stereo headsets may have adverse effects on individuals' performance effectiveness.

Members of our personal-stereo group were allowed to listen to any type of music programming during the work shift. Our listening log data indicated that they listened to a variety of music types ranging from country to rhythm and blues. Consistent with previous studies focusing on background-music systems (cf. Freeburne & Fleischer, 1952; McGehee & Gardner, 1949; Newman et al., 1956), results suggested that employees responded similarly to all music types. However, the results of our study say little about the effects of programming other than music (e.g., all-talk and all-sports). Lipman (1993) has argued that many employees will select such programming and that it will distract them from their jobs. Research is now needed that systematically examines whether employees select nonmusic programming for their personal stereos and if this influences their satisfaction and performance effectiveness.

Although this study showed that stereo headset use was positively related to several employee responses—particularly if they worked on jobs that were simple in nature—one should be somewhat cautious in interpreting the results. Our study was conducted for only a 4-week period, and it is possible that the positive relations observed were only temporary and would vanish over time as individuals adapt to the music provided by stereos. Alternatively, it may be that individuals' responses to music would improve over time as they become more comfortable with headset use. Research is needed that examines these possibilities by investigating the long-term effects of stereo systems on employees' personal and work outcomes.

Another reason to be cautious in interpreting our results involves the design of the research itself. Because the study was a quasi-experiment, individuals were not randomly assigned to experimental and control groups, and generalizations about the effects of personal stereos are not technically appropriate. We did randomly assign

individuals who expressed a preference for stereos (i.e., own–use and loan–use) to an experimental group, but our control group consisted of (a) those who expressed a preference for stereos (i.e., own–do not use and loan–do not use) but were randomly assigned to a no-stereo condition and (b) those who expressed no interest in stereos (i.e., would not use). Given this design, it is quite possible that many members of the control group differed in important ways from those in the experimental group and that these differences explained the relations between stereo use and outcomes observed in this study. For example, it is possible that those in the would not use subgroup had stronger "stimulus screening skills" (Mehrabian, 1977) than those in the experimental group and that they would have benefited little from the masking qualities of stereo headsets. Research is now needed that systematically examines whether individual-difference measures, such as screening skills, differ as a function of stereo headset preference.

It is also possible that individuals in the experimental group responded differently than those in the control group to some unmeasured change in the environment. For example, it is possible that there were increased demands for services during the course of the study and that members of the experimental group increased their performance in response to these demands whereas members of the control group restricted their performance in an effort to express their displeasure with (a) being denied the use of headsets that were originally of interest to them or (b) the fact that others were allowed to use headsets that they experienced as distracting. Some indirect evidence for the possibility that certain individuals were dissatisfied with their assignment to experimental conditions was found in our unexpected results showing that between T1 and T2 the control group reported lower music control and higher fatigue (see Table 3). Research is needed that controls for these alternative explanations by randomly assigning all participants to experimental and control conditions.

Finally, although our study suggests that many employees may respond positively to the use of stereo headsets, it is possible that headset use has some potentially serious undesirable consequences for employees and organizations. For example, it is possible that individuals using headsets have difficulty hearing verbal warnings, alarm signals, telephones, and verbal instructions from supervisors and coworkers (Lipman, 1993; Powell, 1994). In addition, personal-stereo users who listen to music at very high levels may experience permanent hearing loss (Huber, 1984)—something for which employers allowing headsets at work may be held liable (Lipman, 1993). All of the aforementioned disadvantages may more than offset the potential advantages of headset use and should be carefully considered before personal-stereo headsets are introduced into work organizations.

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Received May 5, 1994
Revision received February 13, 1995
Accepted February 14, 1995 ■