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EFFECTS OF AFFECTIVE AND INFORMATIONAL CHARACTERISTICS OF WORK ENVIRONMENTS ON WORKER SATISFACTION

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ABSTRACT

Workers in eleven businesses (e.g., a trucking company, a warehouse, a county hospital, a computer company) rated the physical and social environment in which they worked using three nearly independent measures of pleasantness-unpleasantness, dominance-submissiveness inducing quality, and "information rate." Complexity, novelty, variability, and unpredictable quality of a situation jointly characterize its "information rate" and are positive correlates of the arousal elicited by the setting. Two measures of worker satisfaction used were the Job Satisfaction Index (JSI) and a new Worker Satisfaction Scale (WSS). Internal consistency-reliability was .77 for the WSS and compared favorably with .57 for the JSI. The WSS correlated .60 with the JSI and .71 with a modified version of the JSI from which unsatisfactory items were eliminated. Results with both the WSS and the JSI showed that worker satisfaction was a positive correlate of pleasantness, and information rate, of work environments. In addition, an Information Rate X Dominance Interaction on WSS scores showed that workers whose work environments made them feel submissive (e.g., those in low-status positions) were more satisfied with work settings which provided greater variety, complexity, and/or novelty. In comparison, workers who felt dominant due to environmental factors, did not exhibit a parallel preference, possibly because their work provided the necessary complexity and/or variety and additional information from the work setting was not required.

Aside from work or task characteristics themselves, the physical and social environment of work can have a significant effect on worker morale and satisfaction. Although studies usually did not employ worker satisfaction as the dependent variable, some findings can be used to infer contributions of environmental conditions to the satisfaction of workers. Even when noise levels were below

sixty-four decibels, assumed to be acceptable by design engineers, workers complained about noise, particularly the conversation of others [1]. Black and Milroy found that workers expressed more dissatisfaction with air-conditioned than with nonair-conditioned buildings [2]. There were more complaints about lack of privacy in open-plan offices, particularly by individuals who previously were used to working alone or only with a few others [1]. Rapoport found employee dissatisfaction with an office environment that was inflexible in design and which provided no opportunities to personalize the spaces [3]. There was greater employee desire (assumed to be satisfying when fulfilled) to be consulted about office design, windows, flooring materials, colors, heating, air-conditioning, particularly for their personal work areas [4]. Worker satisfaction was greater with work spaces which connoted higher status [5] and with work spaces which workers could treat as their own territories [6].

If the preceding findings seem inadequate for a general characterization of the effects of work environments on worker satisfaction, it is because of the multitude of variables which are needed to describe those environments. Sets of variables relate to noise, temperature, lighting, colors, designs, space shapes and sizes, density of equipment, crowding, movement and change, proximity of other workers, and relative freedom to converse with coworkers. Due to the large number of variables involved, it is extremely cumbersome to assess the overall impact of work environments in terms of such detailed physical and social characteristics of the settings. Mehrabian and Russell proposed an alternative approach to the evaluation of environmental influences in terms of the emotional impact of environments [7]. Building on work with the semantic differential [8], they proposed a three-dimensional framework of emotional reactions to assess the emotional impact of various environments. In three studies, the three dimensions of pleasure-displeasure, arousal-nonarousal, and dominance-submissiveness (which parallel the three semantic differential dimensions of evaluation, activity, and potency) were shown to account for 60 to 64 percent of variance in emotional reactions to a diverse set of sixty-five situation. [7, Chapter 2].

Pleasure-displeasure can be assessed from verbal report and nonverbal expressions such as smiles, laughter, and frowns. Levels of arousal is also assessed from verbal report, from an intercorrelated set of nonverbal cues such as vocal activity, speech rate, and speech volume [9], and characterizes the level of activity and alertness of the organism. Dominance-submissiveness refers to a feeling of power, control, or influence, versus lack of power and inability to control or influence a situation. Dominance-submissiveness can be assessed from verbal report and from the degree of postural relaxation of an interactant in social situations [9].

The concept of "information rate" was proposed [10] as a superordinate dimension to encompass the complexity, patterning, novelty, familiarity, scale, distance, good-bad form, variation, density, heterogeneity, crowding, surprising, asymmetrical, contrasting, and related qualities of environments. Review, and findings from studies [10], showed that the latter characteristics of environments were

interrelated and jointly tapped the complex, changeable, unexpected, and novel qualities of settings. Information rate is the environmental counterpart of arousal-nonarousal and the two have been shown to be positively correlated (e.g., correlations of .57 and .44 obtained in two studies) [10]. Whereas arousal-nonarousal assesses individual subjective reactions to external environmental influences, information rate deals directly with the environmental features which influence arousal. Conceptually, then, and in terms of past findings, information rate can be used as a substitute for arousal-nonarousal in assessing environmental effects. In the present study, the information rate measure was deemed to be more appropriate (and possibly more reliable) than the arousal-nonarousal measure. Thus, the information rate measure [10] was employed along with the state pleasure-displeasure and state dominance-submissiveness measures developed by Mehrabian to assess the combined influences of the physical and social environment at work [11].

Hypotheses of the present study were based on findings from a related study [12]. In that study, subjects reported their preference and desire for working in a large variety of situations presented to them with brief written descriptions. The strongest findings indicated that preference for work and/or desire to work (assumed to be correlates of worker satisfaction) were positive correlates of work-situation pleasantness and negative correlates of work-situation arousing quality. Pleasantness of the work environment understandably enhanced preference for work. And, more arousing work environments (i.e., environments with higher information rates), insofar as they posed as distractions to the various tasks, reduced preferences for work. The present study differed from the Mehrabian and West study [12] in that the dependent measures assessed worker satisfaction (but not the related measure of preference for work) in actual work settings and pleasure-displeasure, information rate, and dominance-submissiveness were reported by subjects for work settings with which they had everyday familiarity. In line with findings from the Mehrabian and West study [12], it was hypothesized that worker satisfaction is a positive correlate of the pleasantness, and a negative correlate of the information rate, of the physical and social environment at work.

METHOD

Subjects

The subjects consisted of thirty-eight men and eleven women recruited individually from eleven business organizations, including a trucking company office, a warehouse, a county hospital, an engineering company, a computer company, and a pharmaceutical company. Mean age was thirty-one years with a standard deviation of nine years. Occupations ranged from clerical to technical

personnel, engineers, physicians, and administrators. The mean for years of schooling was fifteen years with a standard deviation of 2.8. Fifty-four percent of the subjects completed the questionnaire during their time off from work; the rest completed the questionnaire during work.

Materials

Measures of emotional reactions to work settings — Two dimensions of emotional reactions to work environments were assessed using the state (rather than trait) versions of Mehrabian's pleasure-displeasure and dominance-submissiveness measures [11; 13, Chapter 4]. The thirty-nine items from these two scales, which were in semantic differential format, were intermixed and presented as a group. Both scales were balanced for response bias with equal numbers (almost equal in the case of the dominance scale) of positively, and negatively, worded items. The 24-item pleasure-displeasure scale is illustrated by the items "adverse-friendly" and "calm-uninterested." "Infatuated-masterful" and "daring-amazed" illustrate the 15-item dominance-submissiveness scale.

Measure of information rate of work settings — This was a 14-item semantic differential type scale [10]. A large number of concepts employed in environmental psychology (e.g., complex, random, jarring, heterogeneous, dissonant, intermittent, rare, novel, surprising, meaningless, asymmetrical, close, crowded, dense) were analyzed and interrelated in developing the final 14-item measure of information rate. In its final form, the measure of information rate provides an assessment of the joint contributions of the complex, changeable, unexpected, and novel qualities of a setting. Sample adjective pairs in the semantic differential type measure of information rate were "random-patterned," "dense-sparse," and "complex-simple."

Measures of job satisfaction — Two measures were employed. The first was the Job Satisfaction Index (JSI) [14] and the second was a new Worker Satisfaction Scale (WSS) specifically prepared for the present study. The former had thirty items, whereas the latter consisted of fifteen items based on dimensions of worker satisfaction identified in the literature (e.g., [15-18]).

Procedure

Each subject received a packet of the following five verbal-report measures:

1. A short form assessing age, sex, schooling, occupation, number of years at the present job, and place where questionnaires were completed;
2. The two state measures of pleasure-displeasure and dominance-submissiveness [11] with items intermixed within one form;

3. The information rate scale [10];
4. The Job Satisfaction Index (JSI); and
5. The Worker Satisfaction Scale (WSS).

Subjects completed the various forms in the order listed. For the emotional response and information rate measures, subjects were requested to report reactions to the physical and social aspects of their work environments without consideration of the tasks they performed.

Results and Discussion

Internal consistency-reliability and convergent validity of the new Worker Satisfaction Scale (WSS) — A total satisfaction score was computed for each subject using the fifteen items of the WSS. Item-total correlations were computed and led to the deletion of three items which did not exhibit sufficiently high item-total correlations. The remaining twelve items were balanced for response bias with six positively, and six negatively, worded items. The final 12-item Worker Satisfaction Scale is given in Table 1. Evidence of internal consistency for the WSS is a satisfactory .77 KR-20 reliability coefficient [19]. The 12-item WSS had a mean of 11 and a standard deviation of 15 for the present sample of subjects.

A KR-20 reliability coefficient also was computed for the JSI and was .57. Thus, although the JSI was included in the present study in part to assess convergent validity of the proposed WSS given in Table 1, it only exhibited marginal reliability and results obtained with it need to be interpreted with caution.

Evidence of convergent validity for the new Worker Satisfaction Scale was its correlation of .60 with the JSI ($df = 47, p < .001$). The JSI was improved through item selection by eliminating thirteen of its items which exhibited unsatisfactory correlations with total scores on the JSI. The thirteen eliminated items were 3, 4, 5, 7, 13, 14, 17, 20, 22, 25, 27, 28, and 29. Modified 17-item JSI total scores correlated .71 ($df = 47, p < .001$) with Worker Satisfaction Scale scores, indicating a satisfactory level of convergent validity for the proposed new measure of worker satisfaction in Table 1.

Internal consistencies-reliabilities of the independent measures — The Kuder and Richardson coefficient of internal consistency-reliability was computed for each of the three independent measures [19]. The KR-20 coefficient was .92 for the 24-item state pleasure-displeasure scale, it was .78 for the 14-item information rate scale, and was .81 for the 15-item state dominance-submissiveness scale. All three reliabilities were deemed to be satisfactory.

Intercorrelations among the independent measures — The pleasure, arousal, and dominance scales were designed to be mutually independent [11]. Information, the environmental counterpart of arousal-nonarousal, was used as a substitute

Table 1. Final Form of the Worker Satisfaction Scale (WSS)

Please use the following scale to indicate the degree of your agreement or disgreement with each of the statements below. Record your numerical answer to each statement in the space provided preceding the statement.

+4 = very strong agreement
+3 = strong agreement
+2 = moderate agreement
+1 = slight agreement
0 = neither agreement nor disagreement
–1 = slight agreement
–2 = moderate agreement
–3 = strong agreement
–4 = very strong agreement

_____ (–) 1. I am not satisfied with my pay.
_____ (+) 2. I get many chances to make friends at work.
_____ (–) 3. I don't feel as though I have much job security.
_____ (+) 4. My work gives me an opportunity to develop my special abilities.
_____ (–) 5. At work I am not given a chance to do the things I do best.
_____ (+) 6. My chances of promotion at work are good,
_____ (+) 7. Everything considered, I am satisfied with my job.
_____ (+) 8. I usually leave work with a good feeling that I have done some things especially well.
_____ (–) 9. If I were shopping for a new job, I would not take the one I have now.
_____ (–) 10. I am dissatisfied with the way I am supervised at work.
_____ (+) 11. My work is interesting most of the time.
_____ (–) 12. What I don't like about my work is that I usually don't get a chance to work independently or to use my own judgment on how to do things.

NOTE. Item wording (and scoring) directions are indicated by (+) and (–) signs preceding the items. A total score is computed for each subject by algebraically summing his/her responses to the positively worded items and by subtracting from this quantity the algebraic sum of his or her responses to the negatively worded items. The scale had a mean of 11 and a standard deviation of 15 for the present sample of subjects.

for the latter in the present study. Pleasure-displeasure scale scores correlated .20 with information rate scale scores and .02 with dominance-submissiveness scale scores; information rate scale scores correlated –.04 with dominance-submissiveness scale scores. Thus, intercorrelations among the three selected independent measures were satisfactory in that they were small and insignificant ($df = 47, p > .05$).

Analysis of worker satisfaction as a function of the emotional impact, and information rate, of work settings — Regression analyses were employed in preference to analyses of variance to test main effects, since the former did not necessitate partitioning of the independent variables. Additional advantages of regression analyses were that they:

1. Did not require orthogonality of the independent measures; and
2. Provided estimates of strengths of relationships for the main effects which generally are more reliable (or replicable) than interaction effects.

Computation of cell means for interactions necessitates partitioning of the independent measures. Thus, analyses of variance which also require such partitioning were employed to test for interaction effects.

Stepwise multiple regression analyses explored significant contributions to worker satisfaction of pleasantness P, information rate I, and dominance-inducing quality D of work settings. Significant .05-level effects are given in equations (1) and (2) for the two measures of worker satisfaction employed.

$$\text{Worker Satisfaction (WSS)} = .34\,P + .28\,I \quad (.48) \qquad (1)$$

$$\text{Job Satisfaction Index (JSI)} = .34P + .32\,I \quad (.52) \qquad (2)$$

The quantity in parentheses to the right of each equation is the multiple regression coefficient. Results obtained with the two worker satisfaction measures corroborated each other closely in showing that worker satisfaction was positively related to the pleasantness of work environments and was also positively related to the information rate in work environments. Thus, the first hypothesis regarding beneficial effects of pleasant work environments on worker satisfaction was supported. However, the positive relationship of worker satisfaction with information rate disconfirmed the second hypothesis which was based on the work preference-arousal findings (from [12]). Data obtained by Mehrabian and West were based on subjects' reports of preference to work (but not directly of satisfaction) in various hypothetical situations [12]. In contrast, the present data were obtained from workers who reported their levels of satisfaction in actual work situations. Thus, the present findings, replicated for both dependent measures, are probably more valid. Nevertheless, the beneficial influence of high environmental information rates on worker satisfaction identified here requires additional experimental tests.

The contribution of greater information rate to worker satisfaction was clarified somewhat by the following additional analyses. Analyses of variance were employed to assess possible interactions among pleasure, information rate, and dominance in determining worker satisfaction. For the latter analyses, each independent factor was dichotomized at its mean. Two analyses of variance explored possible significance of Pleasure x Information Rate, Pleasure x Dominance, and Pleasure x Information Rate x Dominance on worker satisfaction as assessed by the WSS and, separately, by the JSI.

Information Rate x Dominance was the only significant interaction ($F = 3.8$, $df = 1/41$, $p < .06$) for the Worker Satisfaction Scale (WSS). None of the interactions was significant for the JSI measure. Cell means for the Information Rate X Dominance interaction on WSS scores showed that workers who felt submissive at work were significantly more satisfied in high-information settings (17.94) than in low-information settings (1.83) ($t = 2.61$, $df = 22$, $p < .01$). Workers who felt dominant at work did not show a significant difference in satisfaction in high-information (11.90) and low-information (9.82) settings. Also, dominance versus submissiveness had no effect on worker satisfaction in the low-information or the high-information conditions.

Although the significant Information Rate x Dominance interaction needs to be treated tentatively until replicated, it nevertheless revealed an intriguing result. Individuals who were made to feel submissive at work due to a combination of physical and social environmental conditions, were less satisfied when they worked in low-information (i.e., low complexity, unchanging, predictable) environments than when they worked in high-information environments. In short, workers who felt submissive due to environmental factors (e.g., low-status workers), tended to prefer and to be more satisfied with work environments which provided greater variety, complexity, and/or novelty (e.g., where co-workers were present and social interaction was possible; work settings which were colorful, textured, and were elaborately decorated; and those which had music, and presented opportunities to move about and to work in difference spaces or rooms). In this context, then, the present finding was consistent with that of Němecek and Grandjean [1], who found that low-status employees enjoyed the greater social activity that was promoted by open plan offices. In the present study, in comparison to workers who felt submissive, those who felt dominant due to environmental factors (e.g., high-status workers) did not exhibit a parallel greater preference for higher information work settings. This may be because the work dominant workers performed provided the necessary complexity and/or variety and additional information from the work settings was not required.

Additional experiments employing larger samples of workers from an even greater diversity of work settings are needed to assess the reliability of the present, tentative findings. If upheld in future studies, the present results can have far-reaching implications regarding the design of high-information rate environments for workers in lower echelons (submissive positions) in work settings.

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