Psychological Reactions to Working Underground: A Study of Attitudes, Beliefs, and Evaluations

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The purpose of this article is to describe data collected on psychological reactions to working underground. A survey was conducted with persons who work underground in the Kansas City area to examine attitudes and beliefs about the underground work environment. By most estimates, several thousand people are now employed in underground work environments in Kansas City. This paper presents four sets of findings: (1) workers' attitudes and beliefs about the underground work environment, (2) workers' perceptions of the effects of underground mining on their work, (3) workers' perceptions of the effects of underground mining on their families, and (4) workers' perceptions of the effects of underground mining on their health. The findings indicate that workers who work underground in the Kansas City area have a positive attitude toward their work and that they believe that their work is beneficial to their families and to their health. The findings also indicate that workers who work underground in the Kansas City area have a positive attitude toward their work and that they believe that their work is beneficial to their families and to their health. The findings also indicate that workers who work underground in the Kansas City area have a positive attitude toward their work and that they believe that their work is beneficial to their families and to their health. The findings also indicate that workers who work underground in the Kansas City area have a positive attitude toward their work and that they believe that their work is beneficial to their families and to their health.
This study is methodologically superior to most but was conducted with a small sample, and its generalizability is open to question.

Questions for Research

From the above review it is clear that more research into the psychological response to the underground is indicated, especially with respect to the Kansas City area. Several basic questions remain to be answered. This study addresses three questions:

1. What is the overall psychological response to working underground? The report will examine general attitudes toward the underground as well as the perceived advantages, disadvantages, and perceptions of safety and efficiency.

2. How do people evaluate various facets of their underground work environment? This assessment will include global evaluations and ratings of physical characteristics such as lighting and climate.

3. Does working underground compare favorably to working above ground? Comparisons will be made concerning preference, satisfaction, and mediating variables.

Procedures of the Study

A survey designed to measure overall attitudes toward the underground, ratings of its physical environment, safety of the underground, and comparisons of underground to aboveground environments was administered to persons working underground in Kansas City, Missouri. The survey required approximately 15 minutes to complete and was administered to regular work areas or break areas.

Sampling of Participants

A listing of organizations and the number of employees in each was compiled for five underground development firms in the Kansas City area. A random sample of companies in each development was then selected, insuring that the number of individuals selected in each development was proportionate to the development’s contributions to the total pool of available participants. It should be emphasized that companies, not individuals, were randomly selected. In the event that a company did not participate, an alternate company of similar size in the same development was chosen.

Participants

A total of 312 individuals participated in the survey. The participants were employed by 21 organizations in six underground developments in the Kansas City area. The number of organizations and the number of participants for each development are listed in Table 1. The greatest percentage of participants worked in the Great Midwest Corporation development (28%), followed by Commercial Distribution Center, Inc. (21%), Inland Storage Distribution Center (20%), Fairmont Co. (17%), Space Center, Inc. (10%), and Geospace (4%).

Views of Working Underground

To assess overall reactions to the underground work environment, we measured general attitudes and specific beliefs about working underground. This section of the report describes those attitudes and beliefs by focusing on five areas:

- general attitudes toward working underground;
- most-like aspects of working underground;
- perceptions of safety;
- ratings of efficiency and ability to concentrate.

Atitude Toward Working Underground

To measure general attitude toward working underground we compared responses to two items that asked participants to rate (a) their overall attitude toward working underground and (b) the degree to which they would recommend working underground to a friend. The strategy of combining responses to two or more items generally provides a more reliable indication of attitude and will be followed throughout the report. The distribution of responses for this composite score indicates that the participants held a somewhat positive general attitude toward working underground. Figure 1 shows that a solid majority of participants (62%) agreed somewhat or strongly that they are satisfied with working underground and would recommend it to a friend. (Areas of overlap are noted and marked with an asterisk.) The favorable attitude was accompanied by beliefs about advantages and disadvantages of working underground.

Most-Liked Aspects of Working Underground

We asked each participant to list three things he or she liked most about working underground. A content analysis of responses to this item revealed that four categories could be placed in five categories:

1. climate advantages, e.g., constant, pleasant temperature from weather extremes; lower expenses; care of person vehicle;
2. a novel work environment, e.g., underground locale;
3. few distractions from work, e.g., silence.
4. safe work location, e.g., protection from disasters;
5. miscellaneous, e.g., co-workers, low expenses, convenient location.

In addition to the list of safety concerns, the participants listed spontaneously several safety advantages. These were:

- 1) security;
- 2) protection from severe weather;
- 3) protection from nuclear attack.

To complement these responses we asked the participants to rate their safety from crime in the common area and their work area, the stability of the underground, and their overall perception of safety in their work area and the underground. Responses to these items were combined to form an index of perceived safety (Fig. 3). This index shows that, regardless of specific safety concerns, participants viewed their underground work environment as safe. Those who expressed a serious concern for their safety were a small percentage of the participants (10%), while those who felt safe comprised a solid majority (54%).

Efficiency and Ability to Concentrate

One characteristic of the underground is the potential inability to lower distraction from work and thereby increase efficiency. This section examines perceptions of participants by comparing responses to three items:

- rating of ability to concentrate;
- ratings of distractions.

- ratings of efficiency and functioning.

Figure 5 shows the composite responses to these items. The participants viewed the underground as producing a work environment that is efficient and clearly not distracting. In summary, the attitude of participants toward the underground was generally positive and was accompanied by beliefs concerning advantages and disadvantages. The advantages were related to climate, a novel work environment, few distractions, and safety. The disadvantages concerned primarily the physical environment, such as a lack of sunlight or outside view, inadequate lighting, and ventilation. The participants specified safety concerns, such as the stability of the underground, but they rated their underground work environments as safe. Ratings of concentration and efficiency in the underground were positive as well.

Evaluation of Work Areas

An important element in assessing reactions to the underground work environment may be evaluation of immediate work areas. Satisfaction with physical aspects of work areas was measured by a rating scale of satisfaction with and evaluations of specified features of work areas. Overall, the participants in the survey were mixed in their evaluations of their work areas as far as their satisfaction with and evaluation of the participants to the work areas, we combined responses to three items which asked the participants to rate:

- how proud of their work area they were;
- the efficiency of their work area;
- their general satisfaction with the work area.

Shown in Figure 4 is the combined response to these questions. The average response to the question of overall satisfaction with work areas was fairly high, and for the overall evaluation of work areas. However, 48% of those who completed the survey selected one of the two most positive response options: 16% agreed "strongly" and 32% agreed "somewhat" that they were proud of and satisfied with their work areas and that their work areas were efficient. A large percentage (31%) were neutral in their overall evaluation and a small percentage (20%) were negative.

In summary, the results of this investigation, the participants evaluated specific physical aspects of their work areas—lighting, unpleasant temperature and humidity, and ventilation.
Lighting
Participants in this survey were mixed with respect to lighting conditions in their work areas (Fig. 4). However, it appears that the conditions were most often adequate and that participants did not report any significant issues with lighting.

Climate
Satisfaction with climate in the work area was considered the most important factor, as it affects the three factors—temperature, humidity, and ventilation.

Temperatures
Satisfaction with temperature in the work area was measured by asking participants to rate the temperature concerning (a) warm, (b) coolness, and (c) variability. The combination of these responses showed that participants were generally satisfied with the temperature. However, responses to the individual items (not shown here) showed that individuals tended to be more positive when considering the warm and the variability of temperatures, but more neutral when considering the coolness of the temperatures. This does not indicate, however, that the participants were inordinately concerned over the variability of temperatures that they prefer in the work place (Sundstrom and Sundstrom, in press).

Humidity
The same appraisal was made of humidity and dryness in work areas. The participants were asked to rate the conditions in terms of (a) comfort and dryness and (b) dryness and dryness (Fig. 7). The average response to these questions showed that, overall, respondents were satisfied. Responses to individual items, however, did not show any one area being viewed as much more humid than dry.

Ventilation
Satisfaction with ventilation of air was measured by asking participants to rate (a) level of comfort, (b) level of work areas, and (c) whether work areas were "smoky or smelly." Participants viewed their work areas as generally having similar, though often desirable, situations. The items demonstrate a neutral evaluation of ventilation (Fig. 8). Participants viewed their work areas as neither comfortable nor uncomfortable, neither clean nor unclean. They were also neutral as to whether their work areas were "smoky or smelly." Of the three factors (humidity, temperature, humidity, ventilation), the participants were most satisfied with temperature, followed by ventilation, and least satisfied with the physical aspects of their work areas. Global ratings indicated a mixed reaction, while specific satisfaction ratings of temperature and humidity were positive; average ratings of ventilation were neutral.

Comparison of Underground Versus Standard Settings
A natural question for study is: Are people more satisfied and productive in underground work settings than above ground when they work under normal conditions? This survey does not purport to answer the question, but four items on the survey did address the participants' views of underground versus above ground settings.

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Dissatisfaction with lighting may be more easily traced to one of two sources—insufficient illumination or dissatisfaction with the type of lighting. Standards do exist for illumination: studies indicate that an average illumination of around 40 foot candles is sufficient for most tasks, while greater illumination is needed for older adults. The type of lighting may be a particularly crucial under-ground, where all lighting is artificial. Various types of lighting (e.g., fluorescent, mercury vapor) are used in the underground, and it would be possible to conduct experiments to determine the optimal levels and types of illumination for performance as well as satisfaction. These findings must be tempered by several considerations. Although the survey method is strong with respect to descriptive capacity and generalizability, there are serious limitations in regard to causal inference. That is, it is clear that attitudes toward the underground in Kansas City among those who work there are generally favorable; but why is it that these favorable attitudes toward the underground reflect the satisfaction with a specific employer, one's position in an organization, or simply the status of being employed in a certain economy. Attitudes toward the underground could also be a function of the immediate physical environment rather than its location underground. The amenity provided for the underground employee may be superior to those for a comparable employee above ground, thus leading to a positive attitude.

Another serious consideration involves the interpretation of scale values. Regardless of one's strategy employed, there is always uncertainty in specifying one overall response as positive or negative. The question remains: positive or negative in relation to what sort of structure? A score for a particular item or collection of items, however reliable, can be interpreted only within the context of the above-ground structure. This approach was used here to elicit underground versus above-ground ratings.

Conclusions
This survey was conducted as part of a larger investigation of environmental and other methodological shortcomings. Although the present data are not definitive, the results are consistent with findings elsewhere and with the general tenor of the literature on the topic. For example, studies have shown that people have many causes, ranging from unproductive factory-level levels of done, diesel fuel exhaust, and carbon monoxide to an inordinately strong preference for fresh air. Therefore, accurate specification about causes and solutions would be difficult.

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In spite of shortcomings, these data are rich in descriptive information concerning the employees of the current underground environment. This is the first study of its kind to examine the attitudes and beliefs about the underground environment in Kansas City, and it apprissent at this stage of the investigation remain at a descriptive level. The study provides insight into overall reactions.
to the underground and appraisals of specific facets of the underground environment as well. Responses to open-format items coupled with rating scales provided a depth of information which is valuable for the present description and will also be useful when more precise inferences are desired.

References