NOTES

Assessment of Health Risks in Canteen Kitchens

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The ergonomic, occupational hygiene, and safety factors in canteen kitchen work were examined using worksite surveys and a questionnaire. Pain in the shoulders was found to be associated with the raised position of the upper limbs caused by excessively high working surfaces. Temperature, ventilation, and especially drafts caused the greatest disturbance at the workplace. Measurements revealed that variations in temperature during the day and between the neck and ankle caused the complaints. The most commonly occurring accident involved a wound to the fingers caused by a knife. However, employees reported burns to be the greatest accident risk. The two methods gave the most contradictory results concerning accidents and safety evaluations and the results corresponded best in ergonomic factors.

1. INTRODUCTION

It is possible to evaluate the need for improvements in working conditions as well as potential health risks by either using a questionnaire or surveying the workplace. Although these two methods can generally be used to yield similar results, occasionally the results may differ when measuring certain factors.

This study examines the ergonomic, occupational hygiene, and safety factors of an institutional kitchen working environment. The aim of kitchen work is to produce meals from raw materials for clients. The work is a process in which the articles of food are transferred from one work phase to another. The work is mainly done by hand and the most important working tools are knives, cutters, and boiling and frying equipment. In Finland, most kitchen workers are female. The fluent progress of the work, good hygiene, and health and safety questions are taken into consideration when planning kitchens (Pekkarinen, 1994).

The aim of this study was to compare the results of a questionnaire and worksite surveys to determine whether there is a real connection between employees’ opinions and actual working conditions.

2. MATERIAL AND METHODS

The site selected for study was a catering company responsible for the preparation of lunches for state employees throughout Finland. At the time of data collection (1984–1985), the company had 1,350 to 1,500 kitchen workers in 350 canteen kitchens.

The questionnaire concerning working conditions and health was sent to 200 canteen kitchen workers who were chosen on a random sample basis from 1,350 kitchen workers within the relevant professional groups. The response rate was 83%. The average age of the respondents was 34 years and 98% of them were women. A database was formed from the replies and analyzed by a statistical program.
The surveys and measurements were carried out at 11 canteen kitchens in Oulu and Helsinki. These kitchens employed a total of 91 workers and produced 4,610 lunches per day. In the ergonomic surveys, the dimensions of furniture and equipment were evaluated on the basis of the anthropometric measurements of the workers and the movements required in the work. When the heights of the working surfaces were determined, elbow level was used as the fixed point and ergonomic recommendations based on elbow height were used as comparisons (Grandjean, 1982). The occupational hygiene health measurements included temperature (International Organization for Standardization [ISO], 1982), draft (ISO, 1985), ventilation (Verein Deutscher Ingenieure [VDI], 1984), oil mist content (Suomen standardisoimisliitto [SFS], 1976), and noise (SFS, 1982). The safety surveys were carried out using a checklist consisting of topics such as the sufficiency of work space, transportation of materials, floors, machines and equipment, hand tools, the possibility of burns, and electrical safety. The results of the measurements and surveys were compared with recommendations given generally (Grandjean, 1982; ISO, 1984; Ray, 1984) or specifically for kitchens (Kitchen machines, 1983; Rannikko & Suomela, 1977; Restauranger och andra storhushåll, 1982; Suurkeittöiden rakentaminen, 1978; Työpaikkaruokaloiden suunnitteluhjeet, 1979; VDI, 1984).

The safety survey included an analysis of the 261 accidents that had occurred within the whole company during the previous 2 years. In addition to statistical analysis, the accident chain method (Klen & Väyrynen, 1984) was used to analyze the data.

3. RESULTS

3.1. Questionnaire

In the questionnaire, the respondents were asked to assess the degree of disturbance caused by various health hazards in their daily work. As shown in Figure 1, the factors associated with temperature and ventilation were estimated to be the most hazardous (35%-56%). The second most

![Figure 1. Factors reported as most often causing disturbance in kitchen work.](image-url)
noted factor was noise (35%) and only 13% reported accident risk to be a hazard. However, other factors related to safety were mentioned, such as the lack of space on work tables, the impracticality of working space, or slippery floors. In another question, the respondents were asked to estimate the existing accident risks in their workplaces. The accident risks were perceived to be hazardous as follows: burns, 28%; slipping or tripping, 20%; cuts, 13%; and eye injury, 9%.

Ergonomic factors (e.g., working postures or movements, the height of working surfaces, etc.) were not included in the list. Instead, the kitchen employees were asked about illnesses and symptoms in the muscular and skeletal systems. The questionnaire revealed that 30% of the respondents had medically confirmed muscular and skeletal system illnesses. The most frequently reported locations for ailments were shoulders (76%), the neck and occipital regions (58%), and the lumbar region (59%). Figure 2 shows the location of reported problems according to the stature of the worker. The ailments in the neck–shoulder region appeared most frequently in the shortest workers.

The respondents who reported being disturbed by draft suffered more often from all aforementioned muscular skeletal troubles than those who did not complain of draft (Table 1). The difference between the groups was tested using the chi-square test for cross-tabulation tables and was found to be significant for ailments of the shoulders and lumbar region. Moreover, another 3% of the respondents had medically confirmed hearing damage.

3.2. Surveys and Measurements of the Kitchens
The basis for evaluation in the ergonomic surveys was that the shoulders are relaxed during cutting and mixing only when work takes place at a level of 150 to 200 mm below the elbow,
whereas a lower working level causes a stooped position (Pekkarinen & Anttonen, 1988). Survey results showed that the working table and cutting board were too high for a third of the workers. Other working surfaces found to be too high included the cooker and pot for 80%, small cooking vessels for 34%, and large cooking vessels for 78% of the workers. The only working surface found to be too low was the frying pan for 20% of the workers.

Occupational hygiene measurements indicated that the WGBT index of heat stress did not exceed the recommended level of 26 °C in the kitchens during the day. However, temperatures of 4 to 6 °C above the base level (25 °C) were measured daily while cooking was in progress. In half of the kitchens, this appeared to be due to insufficient ventilation to compensate for the heat produced by cooking equipment (VDI, 1984). With regard to draft, measurements showed that the velocity of air flow exceeded the recommended level only in one kitchen. However, in half of the kitchens the temperature difference between the neck and ankles was greater than the recommended 3 °C (ISO, 1984).

Oil mist content and noise did not exceed the health risk levels. Washing up was found to be the most noisy work task. The noise level (75 dB) at which speech can no longer be understood was exceeded in all kitchens.

Safety surveys found the condition of floors to be inadequate. In eight kitchens the floor was slippery due to the type of material or inclinations used in its construction. The transportation of materials was inconvenient in half of the kitchens, as the working premises were divided into different levels. Other risk areas, like machines and equipment, knives, and electrical safety, met the recommended standards in most kitchens.

3.3. Accident Analysis

Accident analysis revealed the three most common accident chains to be the following:

1. A cut to the fingers caused by a knife when cutting (26%).
2. Wounds to the hands caused by machines and equipment (10%).
3. Collision with an artifact (floor, doors, tables) within the kitchen (7%).

4. DISCUSSION

The results of the questionnaire and surveys are compared in Table 2. According to the questionnaire, the kitchen workers had a high incidence of symptoms and ailments of the muscular and skeletal systems. Complaints concerning the neck–shoulder region were the most frequent, especially in the shortest workers. The symptoms were shown to be associated with the static load in the shoulders. Working at excessively high working surfaces caused the raised position of
TABLE 2. Summary of Different Methods

<table>
<thead>
<tr>
<th>Factor</th>
<th>Disturbing hazard</th>
<th>Symptoms</th>
<th>Survey/measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ergonomic</td>
<td>shoulders not relaxed</td>
<td>shoulders 76%</td>
<td>tables too high 30%</td>
</tr>
<tr>
<td></td>
<td>stumped position of the back</td>
<td>neck 58%</td>
<td>equipment too high 30–80%</td>
</tr>
<tr>
<td>Work hygiene</td>
<td>draft and temperature 35–56%</td>
<td>troubles</td>
<td>temperature changes during the day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>shoulders</td>
<td>difference between ankles and neck</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lumbar region</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>general accident risk 13%</td>
<td>accidents 10% 75–85 dB(A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>risk of burns 28%</td>
<td>% of total: cut 51%</td>
<td>deficiencies in the surroundings 72%</td>
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<td></td>
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the upper limbs: The work table and cutting board were too high for one third of the workers and the kitchen equipment was too high for 30% to 80% of the workers (Pekkarinen & Anttonen, 1988). In cases such as this, it is recommended that the working surfaces be lowered.

Responses to the questionnaire suggested that draft and the other factors connected with temperature and ventilation were frequently informed to be the cause of disturbance to workers. However, physical measurements proved that the complaints of draft were not caused by the velocity of air flow but by the daily variation in temperature or the temperature difference between the ankles and neck. Thus, it seems that when draft is a problem, even a small deviation from the recommendations can lead to inconvenience and complaints. It was also interesting to note that there was a correspondence between draft complaints and troubles in the shoulders and lumbar region.

Ventilation was efficient enough to control the oil mist content, but measures should be taken to improve the control of room temperature in kitchens. Noise was also a cause of disturbance, but the health risk level was not exceeded in the kitchens.

Different methods may not always produce the same results when investigating safety and accidents (Pekkarinen & Anttonen, 1991). In the questionnaire, the workers considered the possibility of burns to be the greatest accident risk in their job. However, the most commonly occurring accident during kitchen work was a wound to the fingers caused by a knife when cutting. In this case, a difference can be seen between objective and subjective risk assessment, which is influenced by the seriousness of possible injury and the conventionality of the danger (Salminen, 1990). The safety surveys found neither of these risks, but instead deficiencies in the surroundings, for example, floors or working space, were noted.

In conclusion, it can be stated that the results of the questionnaire and surveys were most compatible concerning ergonomic factors in the canteen kitchens. Occupational hygiene hazards disturbed the kitchen workers and caused complaints at a lower level of exposure than that known to cause health risk. An interesting finding was that muscular skeletal ailments were associated both with draft complaints and poor ergonomic design. The actual deficiencies found in the safety surveys were quite different from those that really caused accidents or disturbed workers. Thus, it would be necessary to use different methods in parallel to achieve reliable results, especially when safety is concerned.

REFERENCES


