

Job satisfaction of female radiological technologists: Factor analysis using Quantification Theory Type II

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Abstract

Background: Recently, there has been an increased demand for female radiological technologists (hereinafter referred to as female technologists) due to the spread of mammography, but there have been no previous studies on the job satisfaction of female technologists. In this study, we attempted to extract factors that affect the job satisfaction of female technologists to identify factors in the working environment that make it easy for female technologists to work.

Methods: In this study, the results of a questionnaire survey of 287 female technologists in Hokkaido, conducted by the Hokkaido Radiological Technologist Organization “Furattokai”, were analyzed using Quantification Theory Type II. The factors considered were years of experience, number of duty shifts, number of technologists, male-female gender gap, number of job changes, sexual harassment, overtime, and paid holiday usage rate.

Results: The results revealed that in addition to work environments where female technologists can work for a long time, the work content and relationships with male technologists, including sexual harassment, affected the job satisfaction of female technologists.

Conclusions:

This study extracted factors that affected the job satisfaction of female technologists as basic data for creating a working environment that makes it easier for female technologists to continue working for a long period of time, as the demand for female technologists is expected to increase in the future.

The factors that strongly correlated with job satisfaction were not specific to women, as they are also common to men, including “years of experience” and “number of shifts on duty”.

Background

The demand for female radiological technologists (hereinafter referred to as female technologists) has increased in recent years due to the widespread use of mammography. Mammography is a radiological examination that requires the radiological technologist (hereinafter referred to as technologist) conducting the examination to directly touch the breasts of female patients or female examinees (hereinafter collectively referred to as female subjects) who are naked above the waist, which may lead to complaints made against male radiological technologists (hereinafter referred to as male technologists) by female patients. In addition, recently there has been a spread of awareness that “breast cancer screening is performed by female technologists”, and it is now commonplace for hospital websites to state that “breast cancer screening in this hospital is performed by female technologists”. Since mammography and radiation therapy for breast cancer, as well as breast and cardiac ultrasound, require patients to be naked from the waist up, many patients, especially female patients, feel more comfortable with female technologists. It is surmised that there will be an increased demand for female technologists

to be engaged in these examinations and treatments due to the growing need in society in general to respond to the increased need for female technologists.

The increased demand for female technologists with the recent increase in breast cancer screening necessitates medical institutions to secure the necessary number of female technologists. Women tend to be more easily affected by lifestyle changes than men due to childbirth and childcare [1]. Therefore, it is assumed that female technologists would prioritize “comfortable working environment” as a hospital selection criterion, and it is essential that medical institutions provide a comfortable working environment for female technologists. Previous studies on this topic include an investigation on the awareness of work and level of job satisfaction surveying nurses, the majority of whom tend to be women [2], studies on the job satisfaction of nurses [3-5], and a study that identified motivators for continuing life-long employment, comparing the results with doctors currently working in the same workplace [6]. However, there have been no studies on female technologists analyzing how the workplace and working environment affect the job satisfaction of female technologists.

This study used Quantification Theory Type II to extract factors that affect job satisfaction by analyzing the results of a questionnaire survey on female technologists to identify the factors that make a comfortable working environment for female technologists.

Methods

This study analyzed the results of a questionnaire survey relating to Female Radiological Technologist's Working Environment [7] conducted by Furattokai, a women's advancement promotion group established by the Hokkaido Radiological Technologist Organization, to “ascertain the working environment of female radiological technologists” and “prevent staff turnover”. This questionnaire was a questionnaire survey targeting female members of the Hokkaido Radiological Technologist Organization and female members of 12 branches of the Regional Radiological Technologist Organization in Hokkaido. The postal questionnaire was sent to 287 women and responses were received from 166 women (collection rate: 57.8%).

The questionnaire survey items covered content relating to technologists in general regardless of gender, including the person's current modality and the frequency of duty shifts and on-call duties, as well as content specific to women such as whether the respondent performed mammography and treatment, the male-female gender gap regarding such aspects as treatment, whether the respondent had experienced sexual harassment, whether the respondent had experienced maternity harassment, and the status of maternity leave and childcare leave. The question items used for analysis are as shown below.

- Level of satisfaction: Current level of job satisfaction (job satisfaction: 100% conversion)
- Years of experience: Years of experience as a technologist
- Number of shifts: Number of shifts per month

- Number of technologists: Number of technologists registered at the medical institution where the technologist is employed,
- Male-female gender gap: Whether there is a male-female gender gap at the medical institution where the technologist is employed
- Number of job changes: Number of job changes as a technologist
- Sexual harassment: Whether the technologist has experienced sexual harassment at the medical institution where the technologist is employed
- Overtime: Number of shifts per month
- Paid holiday usage rate: Usage rate of annual paid leave

This study used Quantification Theory Type II, a type of multivariate analysis, to extract factors that affect female technologists' job satisfaction. Quantification Theory Type II is a method aimed at differentiating group characteristics using model formulas for the main topics qualitatively expressed in questionnaire surveys. In this study, job satisfaction was set as the external criterion, that is, the explained variable and the correlation with each question was quantified using canonical correlation analysis [8].

Results

Quantification Theory Type II was used to analyze the question response results extracted from the questionnaire survey results. The results showed that the combination that best fits the quantitative function of the question item, namely the model formula, was "years of experience", "number of shifts on duty", "number of technologists", "male-female gender gap", "number of job changes", "sexual harassment", "overtime" and "paid holiday usage rate", and the correlation ratio was 0.404. The partial correlation coefficient for job satisfaction, where each question item is an explained variable, is as shown in the following formula. For the male-female gender gap and sexual harassment, 0 or 1 was input as dummy variables.

$$\text{Job satisfaction} = \{0.382 \times (\text{years of experience})\} + \{0.381 \times (\text{number of shifts on duty})\} + \{0.353 \times (\text{number of technologists})\} + \{0.259 \times (\text{male-female gender gap})\} + \{0.244 \times (\text{number of job changes})\} + \{0.223 \times (\text{sexual harassment})\} + \{0.219 \times (\text{overtime})\} + \{0.195 \times (\text{paid holiday usage rate})\}$$

Table 1 shows the partial correlation coefficient for each question item. The partial correlation coefficient for "years of experience" was 0.382 and that for "number of shifts" was 0.381, which were relatively high. The partial correlation coefficient for "paid holiday usage rate" had the lowest correlation at 0.195.

Table 2 shows the degree of influence between job satisfaction and the extent of influence of each question item.

The factor that had the strongest influence on job satisfaction was years of experience, which was 16 years or more. The second most influential factor was number of shifts, which was one to three shifts per month. The third most influential factor was number of technologists. Although this factor did not have a

characteristic trend, the results revealed that a mid-sized team of 10 to 19 technologists resulted in the highest level of satisfaction, followed by a small team of one to four technologists, and large teams of 40 or more technologists. The fourth most influential factor was male-female gender gap, which lowered the level of satisfaction. The sixth most influential factor was sexual harassment, and the existence of sexual harassment had a negative effect, lowering the level of satisfaction. The fifth most influential factor was number of job changes, with no job changes resulting in a higher level of satisfaction. The seventh most influential factor was overtime, and although this factor did not have a characteristic trend, the results showed that no overtime, working 11 to 20 hours, and working 30 hours or more resulted in higher levels of satisfaction. The factor with the lowest influence was paid holiday usage rate, with the results showing that the satisfaction level was higher when 50% or more of holiday leave was used.

Discussion

4.1 Analysis of questionnaire survey results

The results of the partial correlation coefficient for each question item showed that the strongest correlation was between years of experience and job satisfaction, and the results of the extent of influence between job satisfaction and each question item showed that female technologists with 16 or more years of experience as a technologist had high job satisfaction.

Figure 1 shows the distribution of years of experience of the female technologists surveyed in this study. This shows that female technologists with 16 or more years of experience as a technologist accounted for approximately 30% of the respondents. The aggregate results on childbirth in this questionnaire revealed that approximately half, i.e., 22 of the 51 female technologists with 16 or more years of experience as a technologist had experienced childbirth and 19 of those female technologists responded that they had taken maternity leave, 15 had taken childcare leave, and they had used the maternity leave/childcare leave system for childbirth and childcare.

Although it is difficult to identify a causal relationship between each question item based on these findings, the fact that the results show a connection between “the ability to continue working for a long time” and “job satisfaction” suggests that it is important that medical institutions establish an environment where female technologists are able to continue working for a long time, typified by a working environment that offers leave systems such as maternity leave and childcare leave so that they would be able to have and raise children and enables women to use these systems.

It was initially expected that work with fewer shifts on duty and overtime would have a positive effect on job satisfaction, but conversely, the results of this study showed that the level of satisfaction was higher with one to three shifts and overtime of 11 to 20 hours. The questionnaire survey analyzed in this study did not include questions on salary and allowance, which makes it difficult to fully deliberate this matter, but it is surmised that job satisfaction would be affected more by income, such as salary and allowances, which is the compensation for the work, rather than the direct workload itself.

On the other hand, paid holiday usage rate had the lowest partial correlation coefficient with job satisfaction, which suggests that usage of paid holidays is not prioritized, but job satisfaction was high when the respondents had used 50% or more of their paid leave. This result shows a similar trend to that of results of job satisfaction surveys in general companies and is not limited to hospitals [9]. Based on these findings, the reason that these factors had less influence on job satisfaction overall was because each individual and hospital had various ways of handling payment and different thoughts on these matters. Hence, these differences in values affected job satisfaction, and consequently, they did not produce uniform results in the analysis. However, conversely, these results suggest the necessity of improving the work environment for taking leave, as once this exceeds a certain standard, it affects the level of satisfaction.

The present study revealed that the existence of a male-female gender gap and sexual harassment lowered job satisfaction. Examples of the male-female gender gap highlighted in the responses included “married women are not promoted” and “dedicated technologist for mammography”. The example of “married women are not promoted” is believed to give the individual the impression that their work is not evaluated or treated properly. The example of “dedicated technologist for mammography” is considered to give the impression that the content of their work is limited compared to that of male technologists. Reports have shown that appropriate evaluation and treatment of a person’s work and the content of a person’s work is generally directly linked to motivation for working [10,11]. It can be easily inferred that this type of evaluation and treatment of a technologist’s work and the restrictions on their work content would lower the motivation of female technologists. Furthermore, there is no clear definition of male-female gender gap and sexual harassment, and it also differs depending on the person, which makes it difficult to implement drastic improvements. However, it is important to improve the working environment, including by actively surveying the environment within departments, and appropriately evaluating job performance.

5. Limitations of this study and future outlook

This study extracted factors that affected the job satisfaction of female technologists as basic data for creating a working environment that makes it easier for female technologists to continue working for a long period of time, as the demand for female technologists is expected to increase in the future.

The factors that strongly correlated with job satisfaction were not specific to women, as they are also common to men, including “years of experience” and “number of shifts on duty”. There are two possible reasons for these results.

The first is that a technologist’s job itself is a job where technical ability is demonstrated, so there is no significant difference in the level of satisfaction of female technologists and male technologists. However, since a similar questionnaire survey has not been conducted on male technologists, it is impossible to make a direct comparison or analysis. In the future, conducting a similar questionnaire survey for male technologists and identifying factors that make the working environment more

comfortable for both female and male technologists would ascertain the differences in job satisfaction considered by female and male technologists and clarify the areas that require improvement.

The second is that an insufficient number of responses were obtained for questions specific to female technologists in the questionnaire survey that was analyzed in this study. This is believed to have had an effect on the fact that there were only a small number of factors specific to female technologists that were available for selection from Quantification Theory Type II.

The results of the questionnaire survey analyzed in this study contained a large number of missing values, where responses were not entered for the questions, which created a limitation for analysis. In particular, in response to questions on life events specific to women, such as marriage and childbirth, more than half the respondents stated that they were not married and had not experienced childbirth, which made it impossible to obtain an adequate sample size. This also made it difficult to examine women-specific variables. This point is also reflected in the fact that the correlation ratio, which shows the degree of fit with the model formula, was 0.404. Possible ways of improving this would be to conduct a questionnaire survey that includes not only currently working female technologists, but also female technologists who left their jobs due to marriage or childbirth, and to continue questionnaire surveys to collect more responses.

The questionnaire survey used in this study was the first survey focusing on women in Hokkaido. Regularly conducting these surveys in the future while revising the questions and identifying changes in response content is believed to further clarify factors that make the working environment more comfortable for women.

Declarations

Ethics approval and consent to participate: Not applicable

The data used in this study were secondary data that has been anonymized.

The data used in this study were anonymized secondary data, and therefore, we do not require a consent form or review by the ethics committee.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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validation, Yuji Tani, Akane Kishiume, Manami Karino, Tomoki Ishikawa and Katsuhiko Ogasawara ; formal analysis, Yuji Tani, Akane Kishiume, Manami Karino, Tomoki Ishikawa and Katsuhiko Ogasawara; resources, Yuji Tani, Akane Kishiume ; writing, Yuji Tani, Akane Kishiume,; visualization, Yuji Tani, Akane Kishiume, Teppei Suzuki, Manami Karino, Tomoki Ishikawa and Katsuhiko Ogasawara ; supervision, Katsuhiko Ogasawara ; project administration, Katsuhiko Ogasawara ;

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Tables

Due to technical limitations, tables are available as a download in the supplementary files section.

Figures

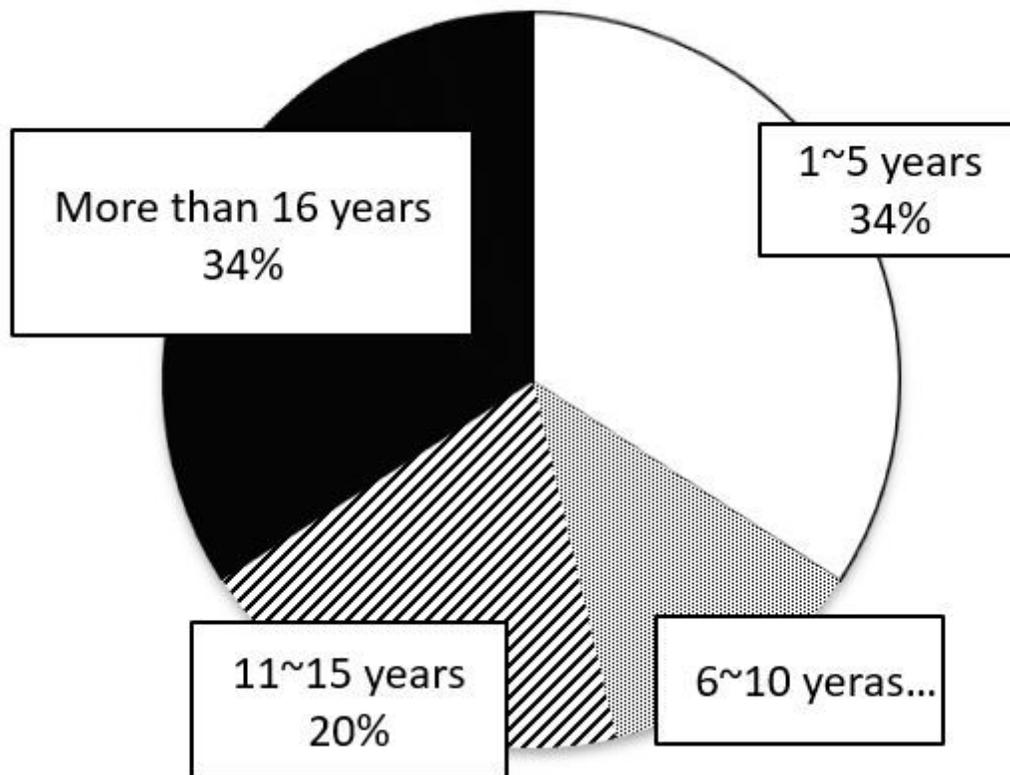


Figure 1

Years of working experience of female radiological technologists in this research

Supplementary Files

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- [tables.docx](#)