

Workplace environment for nurses and healthcare assistants in residential aged care facilities in New Zealand

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KEYWORDS

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ABSTRACT

Objective

Continuous work under environmental and thermal discomfort such as cold, heat, and dim light has the potential to affect the health of nurses and healthcare assistants working in Residential Aged Care Facilities (RACF). The resulting health issues to workers from exposure to thermal discomfort include fatigue, concentration difficulty and work-related diseases such as cold and muscle tensions. Consequently, this often leads to higher labour absenteeism due to sick-leave which in turn correlates to poor nursing care quality for residents. This research investigated environmental factors which are temperature, humidity, noise, and lighting in nurse offices and resident lounges in RACFs in New Zealand and compared them with international standards.

Design

Quantitative study approach.

Setting

Seventeen Residential Aged Care Facilities (RACF) participated in this study, which were categorised in stand-alone (S-RACF), chain (C-RACF), and religious and charitable (RC-RACF) providers. The environmental measurements were conducted for 24 hours in the nurse offices and 12 hours in resident lounges.

Results

The findings demonstrated that the environmental factors, noise and humidity level met international standards predominately, but temperature and lighting levels failed to comply in nursing offices and resident lounges in RACF.

Conclusion

These findings indicate that nurses and healthcare assistants are working in environmental conditions that partially impedes the health and safety of nursing staff, and could affect their nursing care performance adversely for residents in RACF.

INTRODUCTION AND LITERATURE REVIEW

The World Health Organization (WHO) and the International Labour Organization (ILO) describe a workplace as a place surrounded by leadership engagement, worker involvement, common ethics, and culture. This means a workplace consists of a physical work environment, for instance, lighting, temperature, noise, and humidity. Working conditions are associated with work atmosphere, communication styles, job satisfaction, payment, training opportunities, work organisation, workload and stress factors (ILO 2019a; WHO 2010).

Research into occupational health and safety and related fields such as medicine is being conducted, and as a result, there are several environmental standards workplaces and working conditions published, for instance, for offices. These standards consist of definitions, measurement parameters, and recommendations to achieve healthy and safe workplaces and working conditions (ILO 2019b; Federal Institute for Occupational Safety and Health 2015, 2013, 2011, 2010a, 2010b; Accident Compensation Corporation 2010).

Temperature and humidity are significant factors in the well-being and health of employees at the workplace (Federal Institute for Occupational Safety and Health 2010a). The temperature in offices should be between 20 degrees Celsius and 22 degrees Celsius. However, it should not exceed more than 26 degrees Celsius unless the outside air temperature is higher and sun prevention measures are implemented to reduce the air temperature (Department of Labour Occupational and Safety and Health Service 2017; Federal Institute for Occupational Safety and Health 2010a, 2015). For a healthy and comfortable work environment, the physical correlation between the room temperature and the humidity level is essential (Safe Work Australia 2011). Humidity levels at the workplace should be between 40 and 60% because more than 70% humidity stimulates the growth of moulds and fungi (Department of Labour and Occupational Safety and Health Service 2017; Federal Institute for Occupational Safety and Health 2013). People who are sensitive or immunosuppressed could develop headaches, fatigue and concentration disorders. In many cases, if people are exposed to an unhealthy environment for too long, they could develop breathing difficulties and frequent coughing. Also, they can be more prone to respiratory tract related diseases (Canadian Centre for Occupational Health and Safety 2019).

Noise is another essential well-being factor at workplaces. Sound, measured in decibels (dBA), is a vibration that spreads in waves from the noise source. Loud sound equates to a high decibel level. In the workplace, the sound sources are often mixed, such as direct noise at the workstation, indirect noise from the background, and reflected noise (U.S. Department of Transportation 2017; Accident Compensation Corporation 2010). Sound with a decibel level of over 60 dBA is perceived as loud by the majority of people. Continuous loud noise is stressful for the human body and can cause illness and permanent hearing damage. Other adverse effects are fatigue, nervousness, tenseness, isolation and impairment of the performance (World Health Organization 2019; Swiss Federal Office for the Environment 2018; Federal Ministry for the Environment, Nature, Conservation, Building, and Nuclear Safety 2014).

The required level of lighting, measured in lux, correlates with the fundamental work activities, specific hazards and the work environment, for instance: natural or artificial light conditions, contrast, reflections or the transition of natural light over the day. The minimum recommended illumination level for simple work activities, for example, welcoming visitors in an entrance hall or waiting room, is approximately 150 lux and for regular or moderately easy work, and 250 lux should be provided, for instance, for food preparation. There are 300 to 400 lux suggested for low-risk work activities such as common office tasks. The nursing offices should have at least 500 lux and 500 to 1000 Lux are suggested for high-risk nursing activities such as dealing with excretion, human liquids or infectious instruments or with pointed, sharp, moving or hot instrument (ILO 2014; Federal Institute for Occupational Safety and Health 2011; Safe Work Australia 2011).

Employment is considered as health-promoting for an individual's well-being, but on the other side, it also can be pathogenic in an adverse work environment (Williams 2018). The correlation between the working environment and conditions and worker's health is in the interest of occupational science. Previous research has shown that continuous work under thermal discomfort has the potential to affect the health of nurses and healthcare assistants severely with resulting health issues such as fatigue, concentration difficulty, and colds (ILO 2019b; Department of Labour and Occupational Safety and Health Service 2017). As a consequence, this often leads to higher labour absenteeism due to sick-leave which correlates with poor nursing care quality for residents (Castle and Ferguson-Rome 2015; North et al 2013).

There is little knowledge on whether RACFs meet environmental standards for workplaces for nurses and healthcare assistants. This research assumes that the environmental workplace conditions for nursing staff in the nursing offices and resident lounges meet international standards. The research aims at developing a fundamental understanding of environmental related workplace condition for nursing staff in RACFs based on noise, temperature, humidity, and lighting.

STUDY DESIGN

This quantitative investigation in nursing offices and resident lounges in RACFs is part of a mixed method research with a sequential explanatory design to answer whether optimal workplace health, safety and working conditions in RACFs promote high-quality nursing care for residents.

PARTICIPANTS

The quantitative research was implemented in the Greater Auckland Region because more than a third of New Zealand's population lives there (Statistics New Zealand 2013). The three District Health Boards (DHB), Auckland, Waitemata, and Counties Manukau, organise and fund health care services in this area. In total, 183 RACFs with an average of 55 beds per facility provided long-term nursing care services for dependent and older people during the study time (Ministry of Health 2016). The managers of the RACFs in the defined research field received an invitation letter to participate voluntarily in the study based on a randomised list generated by a computer between September 2016 and January 2017. The sample size of this study comprised a total of 17 (1,022 residential beds) out of 183 RACFs (9,777 residential beds) from the determined research field. The RACFs are categorised in stand-alone (7 facilities), chain (6 facilities), and religious and charitable (4 facilities) RACFs (Ministry of Health, 2016).

ETHICS APPROVAL

This study is approved by the University of Auckland Human Participants Ethics Committee on 12 July 2016.

METHOD

The technical measurements were conducted in nurse offices (24-hour period measurement) and resident lounges (12-hour period investigation) in the participating RACFs between September 2016 to March 2017. One set of recording instruments were placed in a box which was located on the main desk in the nurse offices and the second one on a table in the resident lounges. The nursing staff and residents were informed at a prior staff meeting and the data collection day about the purpose of the instrument containers and advised not to touch, move, and unplug it. After the instruments were activated, they recorded autonomously.

The validity and reliability of measurement instruments that were purchased for this study undertaking are ensured by the manufacturer (PCE Instruments UK Ltd). The devices used for the environmental measurements and recordings are listed in table 1.

Table 1: Overview Technical Environmental Measurements and Pedometer Instruments

Environmental Indicator	Instrument	Measurement Intervals	Measurement Place
Temperature	PCE- HT110	Every minute	Nurse Offices, Resident Lounges
Humidity			
Noise	PCE-322	Every ten seconds	
Lighting	PCE-174	Every minute	

The recorded data was directly exported from the instruments to a Windows Excel 2016 sheet. After the data cleaning, a descriptive statistics analysis was conducted.

FINDINGS

Noise Results

Figure 1: Noise Levels in the Nursing Offices of all RACFs (n=17)

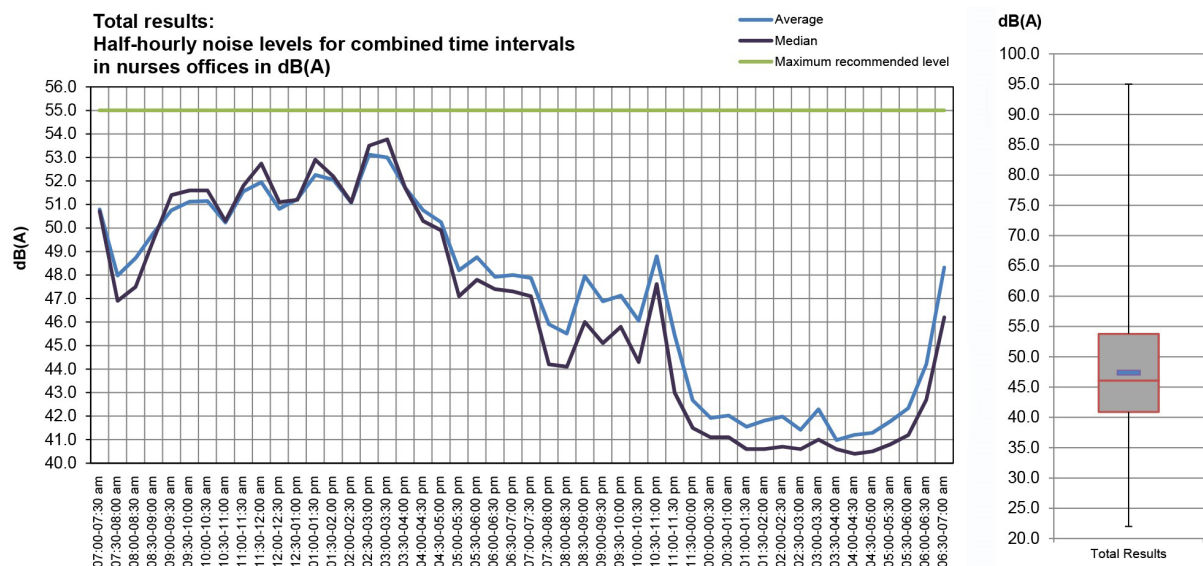
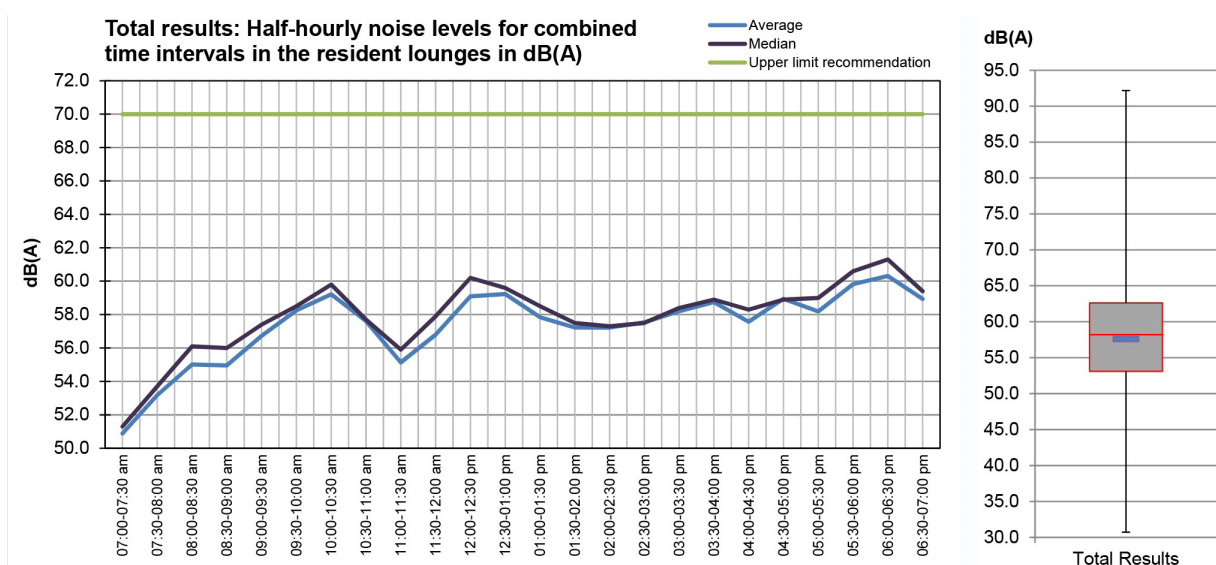


Figure 2: Noise Levels in the Resident Lounges of all participating RACFs (n=17)



In the 24-hour investigation period of noise in nursing offices, the average of 47 dB(A) and median of 46 dB(A) indicated a fairly quiet to a recommended level for the individual perception of noise. Also, in the 12-hour examination period in resident lounges, a normal level for the individual perception of noise within an average and median of 58 dB(A) was detected.

The noise volumes in nursing offices can be categorised as day-time (7am to 5.30pm), evening (5.30 pm to 11pm), and night-time (11pm to 7am) based on similar ranges of dB(A) levels. This means that the approximate average and median noise volumes during day-time ranged between 47 dB(A) and 54 dB(A), in the evening from 44 to 48 dB(A), and in the night-time 40 to 42 dB(A). The investigated time for noise volumes in resident lounges can be classified in the morning (7am to 12.30pm), and afternoon (12.30pm to 7pm). The noise volumes ranged from 51 to 60 dB(A) in the morning and between 60 to 61 dB(A) in the afternoon. The recommended noise limits of 55 dB(A) for offices and 70 dB(A) for resident lounges were not reached throughout the measurement periods. However, single volume measurement points peaked briefly up to 95 dB(A) (Federal Insitute of Occupational Safety and Health 2010b).

Taking all measurement points into account, the noise volumes were within the recommendation and under the maximum limit for offices for 20.57 hours (86% of a day) and in resident lounges for 10.02 hours (83% of 12 hours). In the comparison of the S-RACF, C-RACF, and RC-RACF providers results showed that noise levels were comparable in each noise category except for small and insignificant differences. The average and median noise measurements in nursing offices and resident lounges of all RACF complied with international environmental standards (Federal Insitute of Occupational Safety and Health 2010b).

Temperature and Humidity Results

Figure 3: Temperature and Humidity Results of the Nursing Offices of all RACFs (n=17)

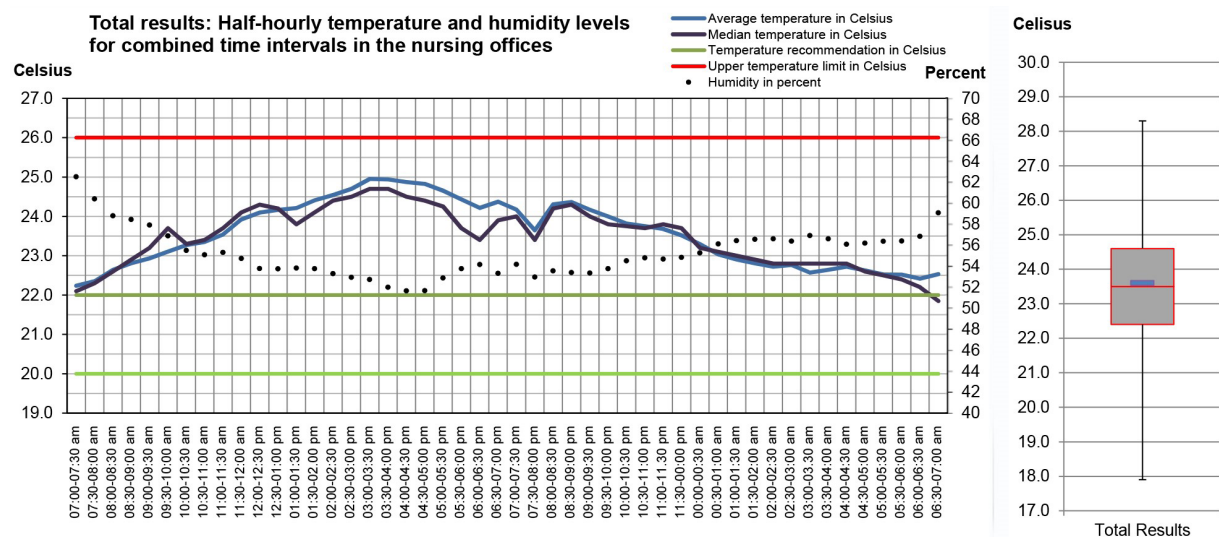
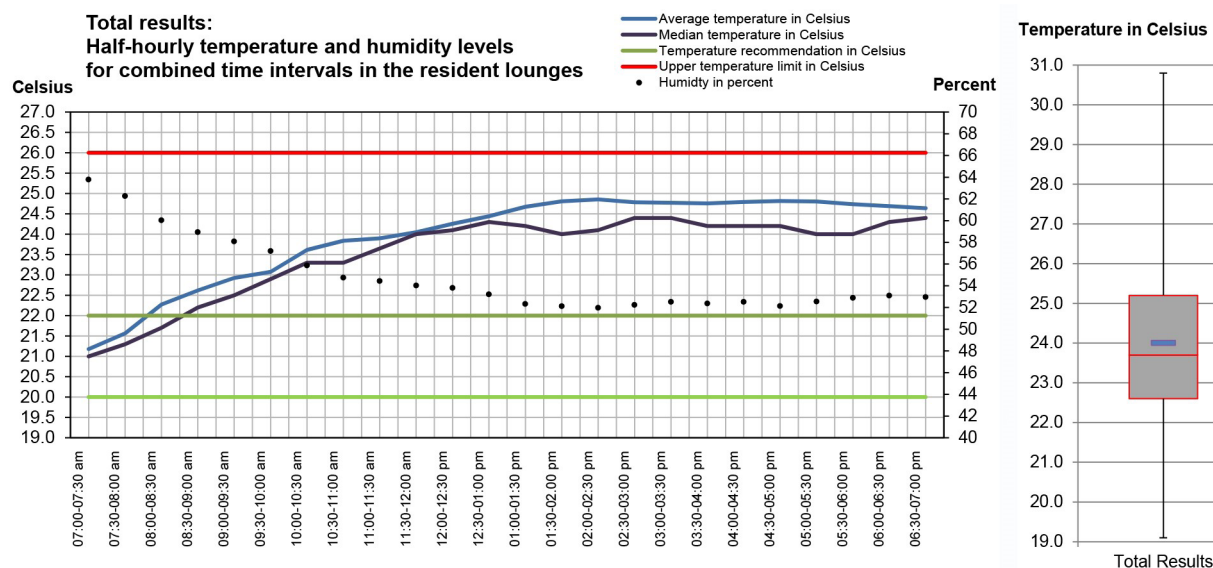


Figure 4: Temperature and Humidity Results in the Resident Lounges of all RACFs (n=17)

The temperature results in nursing offices in the 24-hour examination timeframe demonstrated an average of 23.6 degrees Celsius and a median of 23.5 degrees Celsius. The average temperature levels were continuously higher than the environmental recommendation from 20 to 22 degrees Celsius. The average humidity in nursing offices was 55% and within the recommended parameters of between 40% and 60%. Similar results were found for the temperature conditions in resident lounges during the 12-hour examination. The average temperature was 24 degrees Celsius, and the median was 23.7 degrees Celsius. Apart from two hours in the morning, the average temperature was always higher than the recommended environmental standards. The maximum temperature was measured at 30.8 degrees Celsius. The average humidity in the living room was 55% and met the recommended standards likewise (Department of Labour and Occupational Safety and Health Service 2017; Federal Institute of Occupational Safety and Health 2013, 2010a).

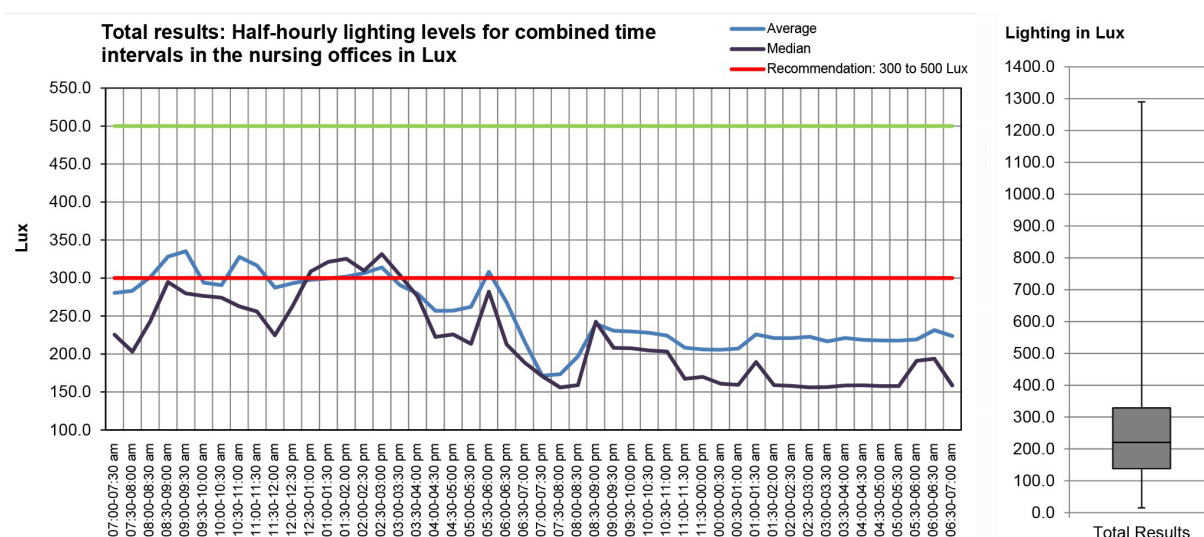
The temperature conditions in nursing offices can be categorised in 'day-time' (7am to 8.30pm) and 'night-time' (8.30pm am to 7am). During the day the average temperature was between 23 to 25 degrees Celsius and at night-time from 22 to 24 degrees Celsius. Single temperature measure points were higher than the upper temperature limit of 26 up to 2.3 degrees Celsius. The temperature recordings in resident lounges can be classified in 'morning' (7am to 1.30pm) and 'afternoon' (1.30pm to 7pm). In the morning the average temperature was 21 to 24 degrees Celsius while in the afternoon it was from 22 to 25 degrees Celsius. Single temperature measurements reach higher levels to a maximum of 30.8 degrees Celsius momentarily at times.

To summarise, the average temperature was within the environmental recommendation in offices for 3.51 hours (15% of a day) and in resident lounges for 1.5 hours (13% of 12 hours). The humidity levels in nursing offices were complied with environmental safety recommendations for 15.63 hours (65% of a day) and in resident lounges for 7.62 hours (64% of 12 hours).

In a comparison of the average exposition to temperature and humidity in nursing offices between S-RACF, C-RACF, and RC-RACF providers the findings demonstrated only moderate differences. In nursing offices and resident lounges, the temperature was predominately too high for more than three-quarters of the investigated time-frame, and only rudimentary met international environmental standards. The humidity levels in both areas complied with international standards approximately during two-thirds of the examined period (Department of Labour and Occupational Safety and Health Service 2017; Federal Institute of Occupational Safety and Health 2013, 2010a).

Lighting Results

Figure 5: Lighting Results in the Nursing Offices of all RACF (n=17)



The lighting results in nursing offices in the 24-hour examination timeframe provided an average of 254 Lux and a median of 203 Lux. During the day the average and median light intensity reached the minimum recommended lighting of 300 Lux occasionally (Office work and low-risk nursing activities). At night the lighting condition was continuously under this level which also means that the recommended level of 500 Lux for high-risk nursing activities was not achieved (Federal Institute for Occupational Safety and Health 2015, 2011; International Labour Organization, 2014). The lighting condition can be separated in 'day-time' (7am to 6pm) and 'night-time' (6pm to 7am). During the hours of daylight, the average and median light was between 200 and 320 Lux. From early evening to morning the lighting levels were from 150 to 225 Lux. For a brief period, single lighting measure points could reach higher levels up to 1290 Lux.

The average and median lighting conditions were within the environmental recommendation for offices and low-risk nursing activities for 3.75 hours, (16% of a day) and 1.78 hours (7% of a day) for high-risk activities. In a comparison of the environmental lighting conditions in nursing offices across all RACF providers, the RC-RACF provided longest exposure of almost 18 hours to low levels of 0 to 300 lux. The C-RACF provider results were similar to the average levels in each lighting category. The lighting exposure of the S-RACF provider was under the average for each lighting level category.

In summary, the lighting situation in the nursing offices was almost throughout lower than the minimum lighting level recommendation for low and high-risk nursing activities according to the environmental standards (Federal Institute for Occupational Safety and Health 2015, 2011; ILO 2014).

STRENGTHS AND LIMITATIONS

One source of weakness of the technical measurements which could have affected the results was that the environmental instruments were occasionally unplugged, covered or moved by nursing staff and residents. This interference occurred despite attached signs on the container which contained the meters and prior verbal notice. Overall, the negative impact on the complete data was 13.6% (200,225 out of 1,468,800 measurement points) of missing noise values, 13.2% (3238 out of 24,480 measurement points) of missing temperature and humidity values, and 29% (212,680 out of 734,400 measurement points) of missing lighting values. Almost 30 per cent of the lighting values in nursing offices were missing. The reason for that was the

high number of measurement errors of the PCE Light-Meter-Instrument compared to the other environmental meters produced by the same company. The display of the light measurement instrument did not indicate any malfunction during the inspections rounds by the researcher. The missing data might be related to connection faults between the measurement sensor and integrated software of the PCE Light-Meter-Instrument. In order to develop reliable results based on valid measurements, a control calculation approach was implemented. No deviations for both methods were identified.

The PCE Noise-Meter-Instrument has an appearance similar to a microphone. It could be assumed that this optic caused nursing staff to hesitate to speak in a normal voice volume in fear of verbal recordings. This would result in lower noise results. However, the noise measurement results show no corresponding influences.

Also, it could be argued that the time of the year and changing weather conditions could compromise the temperature, humidity, and lighting results. However, this conclusion was not substantial because the environmental standards must be met regardless of seasonal weather conditions as per international environmental standards (Federal Institute for Occupational Safety and Health 2015, 2013, 2011, 2010b, 2010a).

DISCUSSION

The development of healthy and safe workplaces and working conditions is challenging due to their complex nature and a high number of influencing risk factors such as work culture, work organisation, and environmental conditions (ILO 2014; WHO 2010, 1994). The physical parameters for measuring the work environment such as noise, temperature, humidity, and lighting have been investigated comprehensively, and robust standards are developed (ILO 2014; Federal Institute for Occupational Safety and Health 2016, 2015, 2013, 2011, 2010a, 2010b; Accident Compensation Corporation 2010). Those standards are promoted on a macro-level by the WHO and national governments. On a micro-level, health and safety standards are implemented by management and health and safety representatives of organisations (ILO 2019b; WHO, 2010, 1994).

The noise findings of this research conducted in nursing offices and resident lounges in RACF complied with environmental standards. This result can be explained that nursing offices are usually restricted to nursing staff only with work-related conversation as the common noise source. On the other hand, nurses and healthcare assistants spend a considerable amount of time in the resident's rooms for treatment purposes and confidential conversations (Mallidou et al 2013). It seems that noise volumes in resident rooms do not affect the volume in nursing offices.

The noise results in resident lounges presented slightly higher volume levels than in nursing offices. One of the likely causes for the marginal higher noise levels in resident lounges is the gathering of residents and visitors to spent time together and take part in activities (Rindel 2012). These findings are typical when people meet and hold conversations (Federal Ministry for the Environment, Nature, Conservation, Building, and Nuclear Safety 2014; Accident Compensation Corporation 2010). However, even the higher noise levels in the resident lounges compared to the nursing offices were within the parameters of the recommended standards. There were no significant differences between RACF providers (Federal Institute for Occupational Safety and Health 2015, 2010b). This means that nursing staff in RACF was not exposed to health risks based on noise volumes. However, this research provides findings of the noise levels but not the type of noises. Further studies need to be carried out in order to develop an understanding of what types of noise in RACF can be stressful and how they affect the health and well-being of nurses and healthcare assistants.

The temperature in the nursing offices and resident lounges were too warm and barely met the recommended levels. One possible explanation for this finding in nursing offices might be that the rooms were often small and packed with equipment, devices, and folders (Federal Institute of Occupational Health and Safety 2018; VGB 2018). Nurses and healthcare assistants working in the office releasing heat through their bodies and computers, printers, and fridges which are generating hot air increase the temperature further (VGB 2018; Marieb and Hoehn 2007).

Limited air circulation could also hinder the maintenance of cooler room temperature. Working in too hot rooms can lead to symptoms such as fatigue, and concentration problems, and diseases, for instance, a cold and conjunctivitis (Wittig-Goetz and Rundagel 2018; Department of Labour and Occupational Safety and Health Service 2017).

Even though average humidity levels in nursing offices and resident lounges were in accordance with environmental standards for two-thirds of the investigated period, there are hours in which the humidity was not within the recommended range. One reason behind this discrepancy could be non-insulated building structure and single-glazed windows. Another major influence can be poor air circulation (Canadian Centre for Occupational Health and Safety 2019; Federal Institute for Occupational Safety and Health 2013).

The type of RACF provider was not related to the humidity results. According to these findings, nursing staff should not physically experience headaches, fatigue and concentration disorders because of either excessively high or low humidity levels (Canadian Centre for Occupational Health and Safety 2019; Department of Labour and Occupational Safety and Health Service 2017; Federal Institute for Occupational Safety and Health 2013).

The lighting situations in the nursing offices did not meet environmental recommendations. This outcome can be due to offices lacking windows or their windows are inappropriately small. The number of light sources and their intensity in a room has a major influence on the lighting conditions (ILO 2014; Safe Work Australia 2011).

The lighting related findings of this study differed greatly between the RACF provider. Even the results between the facilities per RACF group were different and it seems that the lighting situations are strongly related to single RACF. This means that the nursing staff is facing health and safety risks such as eyestrain, fatigue, headaches, muscle tensions, and stress when they implement activities such as dealing with body fluids, body waste, and contaminated objects (VGB 2018; Federal Institute for Occupational Safety and Health 2015, 2011; ILO 2014).

The scope of this study is limited to four environmental factors. For a better understanding of how environmental related hazards affects nursing staff, some fragments are missing, for example, room air speed, air quality, and odours.

In order to develop a better understanding of how occupational-related hazards affect nursing staff, more insights into some fragments, such as room air speed, air quality, and personal perception of odour, are to be sought after.

CONCLUSION

This research investigated environmental workplace parameters which are noise, temperature, humidity, and lighting in RACFs and provided a comparison with international environmental standards.

The findings have identified that the noise levels in nursing offices and resident lounges of all participating RACFs complied with international environmental standards (Federal Institute for Occupational Safety and Health 2015, 2010b). The temperature in nursing offices and resident lounges were predominately too high and met international environmental standards just to a limited extent. The humidity levels were aligned

with international standards for approximately two-thirds of the respective examined period (Department of Labour and Occupational Safety and Health Service 2017; Federal Institute for Occupational Safety and Health 2015, 2013). The lighting situations in the nursing offices were predominately lower than the recommended minimum. This is a risk and an impediment to the implementation of nursing activities (Federal Institute for Occupational Safety and Health 2015, 2011; ILO 2014).

In other words, nurses and healthcare assistants are working in partially suboptimal environmental conditions which in turn could affect their health and nursing care performance for residents adversely (WHO 2019; Castle and Ferguson-Rome 2015; Woods 2015; North et al 2013). However, the individual environmental perception could differ from international standards and recommendations, for example, employees who are sweating excessively over 18 degree Celsius room temperature and workers who suffer from diseases such as hormone imbalance who prefer a cooler working space. This means that it may not be possible to meet recommended standards for workplaces as well as staff expectation at the same time (Department of Labour and Occupational Safety and Health Service, 2017).

The findings will be of interest to RACF employers and organisations who are committed to the provision of providing healthy and safe workplaces for nursing staff. It also contributes to the health sciences and enable a better understanding of the environmental workplace situation in RACF. Continued efforts are needed to generate a well-being environment at the workplace for nurses and healthcare workers in order to provide high-quality nursing care for residents in RACFs.

RECOMMENDATION

The results of this research demonstrated an environmental health and safety risk at workplaces for nursing staff in RACF. To minimise or avoid completely health-related risks at the workplaces a systematic approach is recommended. This includes the identification of relevant environmental standards, risk assessment, implementation of preventive actions, and evaluation of the effectiveness of those measures (WorkSafe New Zealand 2017; Johnson 2002; Deming 1986). At the same time, the workers' voice should be taken into consideration because they have a profound experience and awareness of potential risks at their workstation (WorkSafe New Zealand 2017). After identification of a potential health and safety risk, for example, throughout a workplace risk assessment, the preferred measure is to eliminate the hazard source, for instance, placing printers, copiers and other unnecessary electrical equipment not in nursing offices (Bux 2006). If this is not possible, then actions should be implemented to minimise the risk which includes structural changes such as, determining the optimal place for the light source and changing the location of the workstation, and providing personal safety equipment, such as disposable gloves, aprons, and masks (ILO 2014; Safe Work Australia, 2011).

The implemented preventive actions should be evaluated regularly. If the result is not sufficient according to the recommended standards, then a re-assessment of the workplace situation and environment should be conducted inclusive the implementation of further preventive actions (WorkSafe New Zealand 2017; Johnson 2002; Deming 1986).

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