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Ambience conditions in commercial restaurants

Condições de ambiência em restaurantes comerciais

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Abstract

Introduction: Ambience is the organization acquired by a physical space, involving technical and structural issues of the environment. Besides the physical space, it is also taken into consideration that in this space social and interpersonal relations will take place and that, therefore, the place must be welcoming and comfortable in every sense. **Objective:** Evaluate the ambience conditions in commercial restaurants in Fortaleza-CE. **Methods:** The study was of the observational, cross-sectional, descriptive, and analytical type, developed from December 2018 to February 2019, when the ambience of 20 commercial restaurants in the city of Fortaleza-CE was evaluated. In these restaurants, the reception, pre-preparation and preparation, cooking, sanitation, distribution, inspection of raw materials, meal room, and administrative sectors were evaluated. The evaluation of the food and nutrition units (FNU) was performed by a structured instrument, with a header to identify the company, and in which temperature, noise, lighting, humidity, and floor, wall and ceiling color data were recorded. The data were recorded in Excel® 2013 software and presented in absolute and relative frequency and mean and standard deviations. **Results:** The results showed inadequacies in humidity, temperature, lighting and colors in several sectors of the restaurants evaluated, confirming the hypothesis of this study. **Conclusions:** It is concluded that there are inadequacies of primary ambience in commercial restaurants in Fortaleza-CE, and it can be taken into account that most of the FNUs were built without adequate planning for the health of the employees.

Keywords: Food Services. Lighting. Temperature. Humidity. Noise.

Resumo

Introdução: Ambiência é a organização que um espaço físico recebe, envolvendo questões técnicas e estruturais do ambiente. Além do espaço físico, é também levado em consideração que, nesse espaço, haverá relações sociais e interpessoais e que, portanto, o local deve ser acolhedor e confortável em todos os sentidos. **Objetivo:** Avaliar as condições de ambiência em restaurantes comerciais de Fortaleza-CE. **Métodos:** O estudo foi do tipo observacional, transversal, descritivo e analítico, desenvolvido no período de dezembro de 2018 a fevereiro de 2019, quando foi avaliada a ambiência de 20 restaurantes comerciais da cidade de Fortaleza-CE. Nesses restaurantes, foram avaliados os setores de recebimento, pré-preparo e preparo, cocção, higienização, distribuição, inspeção de matérias-primas, salão de refeição e setores administrativos. A avaliação das unidades de alimentação e nutrição (UAN) foi realizada por um instrumento estruturado que possuía um cabeçalho com a identificação da empresa, e no qual foram registrados dados de temperatura, ruído, iluminação, umidade e cor do piso, parede e teto. Os dados foram tabulados no software Excel® 2013 e apresentados em frequência absoluta e relativa, e em média

e desvio padrão. **Resultados:** Os resultados mostraram inadequações em umidade, temperatura, iluminação e cores em vários setores dos restaurantes avaliados, confirmando a hipótese do trabalho. **Conclusões:** Conclui-se que há inadequações de ambiência primária em restaurantes comerciais de Fortaleza-CE, podendo-se levar em consideração que a maioria das UANs foi construída sem o planejamento adequado à saúde dos colaboradores.

Palavras-chave: Serviços de alimentação. Iluminação. Temperatura Ambiente. Umidade. Ruídos.

INTRODUCTION

Ambience is the organization acquired by a physical space, divided into primary and secondary factors, involving technical and structural issues of the environment, whose primary focus is the planning of physical space.^{1,2}

Primary factors include lighting, color, ventilation, temperature, sound, odors, and noise, which must be suitable for human activities. In addition to physical space, secondary factors, which include social and interpersonal relationships, are also taken into account.^{1,2}

It is proven that the environment reflects directly on the health of the worker, on the performance and the quality of the service provided. It may even be the reason for causing work accidents if irregularities occur.^{3,4}

Excessive noises caused by the voice of the workers and equipment noises, depending on the degree of inconstancy, may cause hearing damage to the workers, headaches, stress, poor performance, psychological changes, and fatigue.⁵⁻⁷ High temperatures, together with hard work, which requires a lot of movement, cause great discomfort and can cause nausea, vomiting, headaches and dehydration, increasing the risk of causing work accidents and decreasing productivity.^{3,6,8} Low temperatures can also be harmful, as they cause stress to the body, hypothermia, dry skin and dermatological diseases, which mainly affect the extremities of the body, such as hands, feet and face, and increase the incidence of respiratory diseases.⁹

Lighting, whether natural or artificial, should be well distributed in all areas of a food and nutrition unit (FNU), as bright or dark kitchens can damage the eyesight of workers.^{2,6,8} It is essential to relate lighting to the FNU colors as light colors increase reflection, and darker colors decrease reflection. Therefore, the colors used on floors, walls, and ceilings must be chosen considering reflection and its effect on the mental health of the workers and to the decor.²

Another important factor in a power unit is the relative humidity of the air that surrounds the environment, which is the amount of water in the air at the location. This humidity varies in two types: low, which can cause allergies and sinusitis, and high, which causes the incidence of fungus and mould.¹⁰

A study conducted in Belo Horizonte-MG evaluated the ambience of four commercial restaurants. The result indicated that all restaurants had lighting and noise outside the recommendation standards and that these irregularities had an influence on the physical and mental health of workers.¹¹ Moreover, in Natal-RN some ambience factors were evaluated, and the noise exceeded what was allowed in all results. As for lighting and temperature, some areas were not in compliance.⁶

In Brazil, the commercial food units segment is constantly expanding, estimated at 10% per year, generating 450,000 new job opportunities per year.¹² This is because Brazilians have been increasing their food consumption outside their homes. According to the latest Family Budget Survey (POF) 2017-2018, eating out currently represents one-third of family food expenses (32.8%).¹³

Considering the expansion of such sector, it is necessary to plan the physical space of the units, because then the workers feel more willing and perform their work better, involving the diligent work that is part of the daily routine of all the FNUs.⁴ After the perception of the influence that the ambience had on the way workers carried out their work and on the result of this work, studies were initiated regarding Food and Nutrition Units (FNUs).³

In Brazil, the food sector has grown, and thus, a greater need to adapt the ambience of the kitchens of commercial restaurants emerged. Therefore, there is a need for further studies to diagnose the environmental

conditions in this segment. This study hypothesizes that commercial restaurants in Fortaleza present non-compliances related to the primary ambience. Therefore, it aims to evaluate the ambience conditions in commercial restaurants in Fortaleza, Ceará.

METHODS

This is an observational, cross-sectional, descriptive, and analytical study, developed in the period from December 2018 to April 2019, in which the ambience of 20 commercial restaurants in the city of Fortaleza-CE was evaluated.

The restaurants were chosen for convenience purposes, and the ambience of the reception, inspection of raw materials, pre-preparation and preparation, cooking, sanitation, distribution, meal room and administration sectors were evaluated. Each restaurant was evaluated for one shift, and measurements were performed in triplicate, following the time intervals recommended by Monteiro et al.,¹¹ with an interval of 1h20min between measurements. The primary ambience parameters evaluated were noise, temperature, lighting, humidity, and colors of floors, walls and ceilings.

A calibrated HIRAKI® digital decibel meter, model HDB-882, which has a range of 30 to 130 decibels (dB), was used to measure the environmental noise. The measurement was carried out at the workstations, and the noise levels were determined near the hearing area of the workers.¹⁴ The adequacy of the noise was evaluated as recommended by Sant'Ana.²

A calibrated Simpla® digital skewer thermometer, model TE07, which has a measurement range of -50 °C to 300 °C; and a calibrated Minipa® digital laser thermometer, model MT-320, which has a measurement range of -20 °C to 400 °C, were used for ambient temperature measurement. The measurement was performed at the height of the chest of the workers.¹⁴ The temperature adequacy was evaluated as recommended by Sant'Ana.²

The ambient lighting was evaluated by measuring the illuminance using a calibrated Lux Minipa® lux meter, model MLM-1011, with LCD 3 1/2 and range of 0-100,000Lux. The measurement was made in the work area where the visual task was performed using a lux meter with photocell corrected for human eye sensitivity and according to the incidence angle.¹⁴ The adequacy of the illuminance was evaluated as recommended by Silva Filho.¹⁵

The Incoterm® brand calibrated hygrometer with a measurement range of 15% to 95% relative humidity (RH) was used to measure the environmental humidity. The humidity levels were measured at the height of the chest of the workers handling the food.¹⁴ Humidity values between 50-60% were considered satisfactory.¹⁰

The colors of the floor, wall and ceiling were also registered, and their adequacy was analyzed according to Sant'Ana's recommendation.²

All information was collected by previously trained researchers and recorded in a structured instrument containing a header with the identification of the company, date of the visit, work regime of the site, and type of activity. It then presented a table, divided into sector, time, temperature, noise, lighting, humidity, floor color, wall color, ceiling color, and notes.

The data were tabulated twice in the Microsoft Excel® 2013 software and analyzed in the Statistical Package for the Social Sciences (SPSS) software version 21.0. The normality of variables was tested by the Kolmogorov-Smirnov test, and the results were presented in absolute and relative frequency and in median,

minimum, and maximum. The difference between sectors was evaluated by the Kruskal Wallis test, followed by Tukey *post hoc*. Values of $p < 0.05$ were considered significant.

RESULTS

The continuous data analysis showed inadequacies in the medians of humidity and temperature in all sectors, with values above the recommended. However, for lighting, the medians were below the recommended value, indicating insufficient luminosity in the areas of the FNU's evaluated. Only regarding noise, all the sectors presented an appropriate median as recommended, which would be up to 85dB (table 1).

Table 1. Description of the primary factors of ambience in commercial establishments. Fortaleza, 2019. Source: Prepared by the authors.

Sector	Humidity (%) Median (min – máx)	Noise (dB) Median (min – máx)	Temperature (°C)(laser) Median (min – máx)	Temperature (°C)(skewer) Median (min – máx)	Lighting (lux/m ²) Median (min – máx)
Cooking	70.2(61.7 – 80.0)	73.8(50.5 – 87.4)	39.2(33.2 – 56.1) ^a	37.3(29.0 – 48.5) ^a	59.0(13.6 – 326.4)
Sanitation	70.6(63.6 – 78.0)	74.2(58.1 – 97.5)	32.2(30.2 – 33.9) ^b	31.4(28.7 – 34.0) ^b	67.3(17.67 – 409.2)
Meal room	69.6(65.3 – 78.0)	73.3(59.2 – 91.6)	32.1(23.5 – 34.2) ^b	31.4(25.3 – 33.6) ^b	96.3(12.1 – 1470.1)
Reception	70.0(64.0 – 80.0)	71.7(60.2 – 86.7)	31.7(27.8 – 35.6) ^b	31.6(28.7 – 35.3) ^b	96.8(11.3 – 816.3)
Pre-preparation/ preparation	69.7(64.0 – 79.0)	73.3(58.1 – 88.0)	32.7(28.8 – 36.9) ^b	31.8(28.5 – 34.9) ^b	81.9(16.0 – 324.4)
Distribution	69.3(67.3 – 79.0)	72.7(50.9 – 85.8)	33.1(24.8 – 43.5) ^b	32.1(26.8 – 40.1) ^b	76.4(55.1 – 444.5)
Inspection of raw materials	70.3(64.0 – 74.0)	73.9(59.5 – 83.8)	32.6(28.2 – 44.2) ^b	31.6(28.1 – 42.3) ^b	79.9(18.8 – 515.4)
Administration	67.6(57.0 – 69.6)	72.1(66.8 – 78.5)	29.4(26.0 – 31.6) ^b	27.7(25.2 – 30.9) ^b	67.8(15.6 – 68.5)
p*	0.484	0.183	< 0.001	< 0.001	0.580

* Kruskal Wallis followed by post hoc Tukey

The medians of humidity, noise, and lighting parameters showed no significant difference across sectors. However, the median temperature of the cooking sector was significantly higher than the other sectors ($p < 0.001$).

When analyzing the suitability after categorizing the data, there was almost no compliance regarding the humidity level of the sectors, considering that in all storage and handling sectors, the humidity was above the allowed. Only the administrative sector of one of the restaurants studied was in compliance.

Although the noise median was within the recommended range, it was above the recommended range in several sectors, with non-compliances more present in the distribution and administrative areas (table 2).

Table 2. Conformity of noise from commercial establishments. Fortaleza, 2019. Source: Prepared by the authors

Sectors	Time 1 n (%)	Time 2 n (%)	Time 3 n (%)
All	126 (96.2)	130 (99.2)	125 (95.4)
Cooking	19 (95)	19 (95)	19 (95)
Sanitation	19 (95)	20 (100)	19 (95)
Meal room	19 (95)	20 (100)	19 (95)
Reception	19 (95)	20 (100)	19 (95)
Pre-preparation and preparation	19 (95)	20 (100)	19 (95)
Distribution	10 (100)	10 (100)	9 (90)
inspection of raw materials	18 (100)	18 (100)	18 (100)
Administration	3 (100)	1 (33.3)	3 (100)

Regarding lighting, it was possible to observe that in almost all sectors of the restaurants, the lighting was insufficient. Only the dining hall of a restaurant proved to be in compliance, according to the recommendations.

There were also only a few compliances for the temperature for the laser thermometer and the skewer thermometer. It was possible to find values per the recommendation only in the dining room, cooking, distribution, pre-preparation and preparation, raw material inspection, and in the administrative sector of few restaurants (table 3).

Table 3. Temperature compliance of commercial establishments as measured by laser and skewer type thermometers. Fortaleza, 2019. Source: Prepared by the authors

Sectors	Time 1 n (%)		Time 2 n (%)		Time 3 n (%)	
	Laser	Skewer	Laser	Skewer	Laser	Skewer
All	2 (1.5)	3 (2.3)	4 (3.1)	3 (2.3)	4 (3.1)	6 (4.6)
Cooking	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)	0 (0)
Sanitation	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Meal room	1 (5)	2 (10)	2 (10)	1 (5)	1 (5)	2 (10)
Reception	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pre-preparation and preparation	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1(5)
Distribution	0 (0)	0 (0)	1 (10)	1 (10)	1 (10)	1 (10)
inspection of raw materials	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1(5.6)
Administration	1(33.3)	1 (33.3)	1 (33.3)	1 (33.3)	1 (33.3)	1 (33.3)

For the colors of the floor, wall, and ceiling, it was possible to notice that the colors of the ceiling were suitable. However, there is almost no compliance regarding the color of the walls, considering that most restaurants use white shades, such as milky-white, lime-white and ice-white, and that these colors are not recommended (table 4).

Table 4. Conformidade das cores de estabelecimentos comerciais. Fortaleza, 2019. Source: Prepared by the authors

Sectors	Floor color n (%)	Wall color n (%)	Ceiling color n (%)
All	28 (21.4)	4 (3.1)	74 (58.7)
Cooking	3 (15)	0 (0)	12 (60)

Table 4. Conformidade das cores de estabelecimentos comerciais. Fortaleza, 2019. Source: Prepared by the authors. (Continues)

Sectors	Floor color n (%)	Wall color n (%)	Ceiling color n (%)
Sanitation	3 (15)	0 (0)	12 (60)
Meal room	3 (15)	0 (0)	6 (33.3)
Reception	7 (35)	3 (15)	12 (70.6)
Pre-preparation and preparation	3 (15)	0 (0)	12 (60)
Distribution	1 (10)	0 (0)	5 (50)
inspection of raw materials	7 (38.9)	1 (5.6)	13 (72.2)
Administration	1 (33.3)	0 (0)	2 (66.7)

DISCUSSION

In this study, conducted in 20 commercial restaurants in Fortaleza, the data obtained revealed that the humidity in the sectors of cooking, sanitization, meal room, reception, pre-preparation and preparation, distribution and inspection of raw materials were not in compliance, with only the administration sector being within the desired standards, which causes thermal discomfort and damage to health. A literature review on thermal comfort assessed that high humidity is represented by high levels of water vapor in the air, causing inconvenience to people exposed to this situation.¹⁶ The ideal humidity is between 50 to 60%, but if this standard is not observed, the disorders caused can occur, such as allergies and sinusitis, as well as mold and fungus, compromising the health of workers.¹⁰

In the state of Rio Grande do Norte, in an industrial kitchen, the cooking, meat pre-preparation, dessert pre-preparation, vegetables pre-preparation, dish-washing, distribution of received containers and receiving of trays sectors were evaluated as to the amount of noise for the time of hours worked, which should not exceed eight hours of work with noise above 85 dB. It was verified that, in all sectors, the noises exceeded the recommended value, showing values that are harmful to health.⁶ In this study, the sectors that presented the most significant inadequacy for noise were the distribution and administrative sectors. High noise levels are usually observed when all employees are talking, and in the presence of equipment turned on, that damages the middle ear's hearing. Over time, this generates speech impairment, which is only observed when the workers already have impaired speech.¹⁷

The data collected show inadequacies of lighting in the sectors of the FNUs studied, which in their great majority presented non-compliances. It was observed that in only one of the restaurants the lighting was adequate. This non-compliance directly interferes with the health of the workers and the work performed.

Corroborating our findings, in Sete Lagoas-MG a study was carried out that evaluated three industrial kitchens and identified the use of mixed lighting, the combination of artificial lighting with natural lighting, which was not yet sufficient to meet the needs of the FNU. Some sectors presented low luminosity, indicating that the non-compliance in lighting hinders the hygiene and cleaning practices in the location, negatively influencing the work of the workers handling the food and interfering in their health.¹⁸

This study obtained data that demonstrated that a small number of the commercial restaurant sectors analyzed had an adequate temperature. The dining hall, cooking, distribution, pre-preparation and preparation, inspection of raw materials, and administrative sectors were inadequate for the work of the employees and their health, as the temperature was one of the significant factors of influence. In contrast to

our data, in Minas Gerais, in the municipality of Leopoldina, three industrial kitchens were evaluated, and the temperature was adequate. There was the influence of adequate ventilation, which provided air renewal, in addition to windows that made use of millimeter protection, and exhaust fans, thus ensuring thermal comfort to the environment.⁴ It is important to take into account in this assessment that the climate of two cities in different states directly influences the temperature of the industrial FNU, since Fortaleza is a city with higher temperatures.

According to a study conducted in São Paulo, four FNUs were evaluated, and the results obtained confirmed the interference of the colors of the floor, wall and ceiling in the activities performed in the industrial kitchen. They caused drowsiness, fatigue and excitement, since these colors can influence the way employees perform their daily activities. Colors such as light pink, yellow and light beige are indicated for kitchens, but not for industrial kitchens, since, because there are several stainless steel appliances in the FNU, the reflection rate is lower, thus making the environment darker.¹⁹ The result obtained in this work carried out in the kitchens of the commercial restaurants of Fortaleza demonstrated that the colors of the ceiling, in the cooking, cleaning, dining room, reception, pre-preparation and preparation, distribution, inspection of raw materials, and administrative sectors were adequate. However, the colors used in the walls were not appropriate.

It is clear that there are great difficulties for the FNUs to adapt to the legislation, but it is necessary to overcome these obstacles so that there is no damage to the worker's health or low work performance.⁴

CONCLUSION

It can be concluded that there are inadequacies concerning primary ambience in commercial restaurants in Fortaleza, considering that most of the FNUs were built without a favorable planning for the ambience and well-being of the worker.

It is suggested that the management of these commercial restaurants take a critical look at the great impact that these inadequacies may have in the future, both on the restaurant and on the health of the workers.

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Contributors

Araujo EM and Damasceno BH, participated in the idealization of the study design; in the collection, analysis and interpretation of data; in the writing of the study and in the final review and approval of the manuscript for submission. Carioca AAF participated in the analysis and interpretation of the data; in writing the study; in the final review and approval of the manuscript for submission. Adriano LS participated in the idealization of the study design; analysis and interpretation of data; writing of the study and final review and approval of the manuscript for submission.

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