

# THE DESIGN OF ACOUSTIC AND GLOBAL COMFORT IN RESTAURANTS: THE CASE STUDY OF FRATELLI BRIGANTI'S RESTAURANT

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**Abstract:** Acoustic quality and, in wider terms, global comfort are crucial aspects for the design of built environments. There are objective and subjective parameters, from different disciplines, which may be used for contributing to the definition of global comfort. Concerning restaurants, dining out represents an opportunity for spending quality time in good company; therefore, a multidisciplinary approach is required to the designer in order to create a unique experience for all senses. In this paper, factors involved in the assessment of the global comfort are presented. *Vie en.ro.se Ingegneria* has worked for the improvement of global comfort in many restaurants, such as *Fratelli Briganti's Restaurant*. The project was designed and defined starting from the observations collected through a Customer Satisfaction questionnaire, together with the results of acoustics and lighting measurements carried out on site. According to the outcomes, the intervention has interested different disciplines: acoustics, lighting engineering, and thermo engineering. At the end of the renovation, the *Fratelli Briganti's Restaurant* has been reopened and the same Customer Satisfaction questionnaire has been distributed. The outcomes show a general improvement of the comfort conditions.

**Keywords:** global comfort, acoustic design, restaurants

**DOI:** 10.36336/akustika202139119

## 1. INTRODUCTION

Eating out is not only a matter of having meals. People who go to restaurants are aware that rather than spending time away from home, dining out represents an opportunity for conviviality. Several factors contribute to the success of the experience and in the consequent satisfaction of customers [1]. As a matter of fact, the pleasantness of the environment is a multisensory experience to be evaluated as a combination of different contributions perceived through the five senses. The global comfort approach considers different aspects and relationships between various parameters, even related to the use of the building [2]. There are various crucial aspects that take part in the global perception of the space, such as architectural design, psychophysical well-being, lighting, temperature, and noise level. Concerning the physiological information acquired at sensory level, it is processed by the brain and, together with the physical and social factors, they drive to the overall assessment of the environment.

People often have different sensitivities for each of the five senses: perceived well-being and discomfort are related to the characteristics of built environments, which interact with the personal neurophysiological aspects. In this framework, global comfort and acoustic quality are new frontiers in the design of work and living environments, including spaces for leisure [3].

Until the new regulations, due to the spread of COVID-19 emergency and related to the so-called „social distancing“, the aim of the owners of restaurants was to place as many seats as possible in the dining areas, in order to create an atmosphere of conviviality, maximize the number of patrons and, conse-

quently, profits. The architectural design of interiors and space occupation has often been critical from the point of view of global comfort.

## 2. GLOBAL COMFORT

### 2.1. The overall comfort in restaurants

As the pleasantness of eating out is connected with many factors, which may determine the overall assessment of the experience, it is mandatory to have a multidisciplinary approach in the design of restaurants. Focused interventions, elaborated with a holistic approach, are crucial for gaining a space where people feel like home and spend time in comfortable and healthy places. This intends to consider the involvement of all the disciplines that can be applied to the design of buildings in order not to limit the quality of a space to the formal correctness from the normative point of view. Indeed, a well-designed space does not only influence the quality of the experience but even the psycho-physical balance and the desire to go back to a place whose atmosphere has created a positive memory. An important aspect to consider is that Global Comfort is a condition which expresses satisfaction with the environment, and it cannot be achieved as the sum of objective parameters. In this frame, together with the definition of quantifiable variables, subjective evaluation of individuals has to be taken into account.

**2.2. Acoustic Design**

Two critical aspects which generally contribute to the acoustic discomfort are high reverberation and a significant number of occupants. The consideration of these two conditions is of interest in the acoustic design of restaurants. It may be stated that the greater the number of speakers the higher the level of the reverberant field is. The latter compromises the intelligibility of conversations making speech comprehension increasingly complex. Conversation environments can be characterized by the “cocktail party effect”: the presence of several conversation groups makes it difficult to selectively recognize the signal coming from a sound source and ignore disturbing signals. In restaurants, good intelligibility of speech and consequent ease and pleasantness of listening may be achieved by decreasing the average distance between the speaker and the listener, reducing the total number of speakers and consequently the number of occupied tables, increasing the directivity of the source (through loudspeakers) and/or increasing the sound absorption of the room.

The balance of the above-mentioned corrective actions requires the sensitivity of the designers and the managers of restaurants and other convivial spaces towards acoustic comfort. The awareness of the requirements and the usefulness of the intervention are independent from the typologies of restaurants; therefore, it is not only a matter of interest for places where the maintenance of high rating is also linked to the environmental, building and architectural quality. This is the example of “La Cascina dei Sapori” (project by Studio Zanoletti - Brescia, Italy) that has benefited from the interventions in terms of customer satisfaction and greater and better appreciation of the dishes. As a matter of fact, in 2018 it won the prize for best acoustics in the Italian Touring Club Restaurant Guide. Among the restaurants characterized by high acoustic quality, Ametsa Restaurant in London (project by Studio Ab Rogers), Bio’s Kitchen in Rimini (project by Studio Archinow) and the restaurants of the English chain Pizza Express deserve to be mentioned.

**2.3. Other Parameters involved in Global Comfort**

Among the factors involved in the Global Comfort of indoor environments, there are objective parameters which contribute to the overall assessment of spaces, together with architectural design. The light has the role of defining the spaces, along with the colours used for the interior design. The game of lights and shadows create the atmosphere inside the room and, at the same time, has the aim to ensure a good view of the meals that will be consumed. For quantifying the amount of artificial and natural light and how to distribute it inside the room, an adequate level of illuminance, the limitation of the phenomenon of glare, the colour temperature, the correct distribution of light, the uniform distribution of illumination and its correct directionality may be taken into account. On the other hand, the balance of natural and artificial light ensures emotional and psychophysiological well-being, as well as significant energy savings. Additionally, the microclimate of the room interacts with the comfort of the environment as a complex of thermo-hygrometric features. The air temperature and the humidity are measurable parameters, but the thermal sensation of an individual is even related to the amount of energy that human body disperses towards the environment.

Nowadays, indoor air quality has a crucial impact as people spend most of their time in enclosed spaces rather than outside. Because of the increasing pollution, issues related to indoor air quality are widely recognized as important risk factors for health. One of the parameters that can significantly exceed limit values is the concentration of CO2. Nevertheless, most of the variables cannot be detected directly by people, therefore, rooms may be equipped with sensors for the collection of data concerning air pollutants.

Interventions connected with different aspects of global comfort may lead to a positive overall assessment of indoor environments. For the renovation of Fratelli Briganti’s Restaurant, a global approach has been used and has consisted of the design of the improvements on acoustics, lighting, thermo-hygrometric well-being, and air quality.

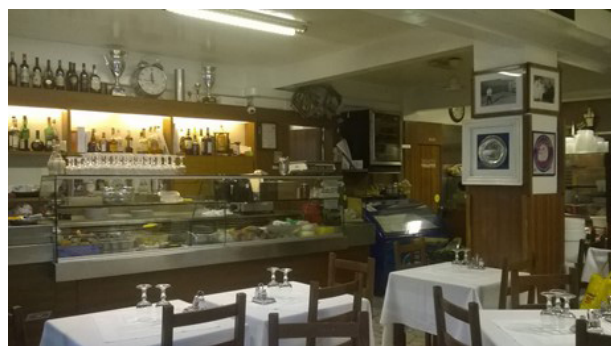


Fig. 1: A picture of the state of art of Fratelli Briganti Restaurant before the intervention in 2019

**3.2. Customer Satisfaction Survey distributed ante-operam**

As above-mentioned, the perceived comfort of the environments concerns both subjective and objective factors. For this reason, the starting point of the project has considered the involvement of the users and their assessment of the restaurant. The participation has been possible through the compilation of an evaluation questionnaire by the customers of the restaurant. The customers’ satisfaction had the objective of highlighting the criticalities of the diners, during the time frame they spend inside the restaurant. The entire questionnaire is reported in Fig. 2. The questions were not limited to the areas subject to intervention but have considered different aspects of quality and perceived comfort, according to objective and subjective parameters.

Twelve questions have been divided into four sections and their contents are displayed in Tab. 1. The question type is a multiple-choice question where only one answer can be selected. The questionnaire was available in Italian language and was filled in by people living in Italy.

Section	Contents of the questions
Characteristics of the sample	1: Age
	2: Place of living
	3: Frequency of dining out at Fratelli Briganti’s
	4: Number of diners
Environmental quality	5: Acoustic quality of the Restaurant
	6: Lighting quality of the dining and tables
	7: Air quality (odours)
	8: Temperature of the room
Other aspects	9: Quality of food
	10: Cleaning
Overall assessment of the restaurant and experience	11: Features of the Restaurant
	12: Assessment of the experience at the Fratelli Briganti’s Restaurant

Tab. 1: Contents of the questionnaire “Customer Satisfaction” distributed to the patrons of the Fratelli Briganti’s Restaurant

The questionnaire has been distributed to 30 patrons, a representative sample that revealed the overall opinion of the comfort of the restaurant in the ante-operam phase. The results showed that the restaurant was highly appreciated for the quality of food despite some non-positive evaluations concerning the other senses. The reported insufficient aspects may be linked to the variables of global comfort and, therefore, lead to specific interventions in the dining rooms. In particular, the difficulty in carrying on conversations was evident: 55% of the interviewees defined the rooms as „uncomfortable for conversation“. A critical overall judgment on comfort factors was shared by 73% of the subjects, and the non-positive judgments mainly concerned acoustics, with the acoustic quality of the room assessed as „average“ or „poor“ by 95% of the interviewees. Moreover, the assessment of other parameters involved in Global Comfort showed that the lighting quality in the rooms and tables was considered „average“ or „poor“ by 60% of the sample. The statements concerning odours which have been mainly selected are „the odours are always present, but they are not very annoying“ and „the odours are always present, and they are very annoying“, and they have been shared by the 55% of the sample. Additionally, the temperature of the rooms was considered „inadequate“ or only „acceptable“ by 45% of the interviewees.

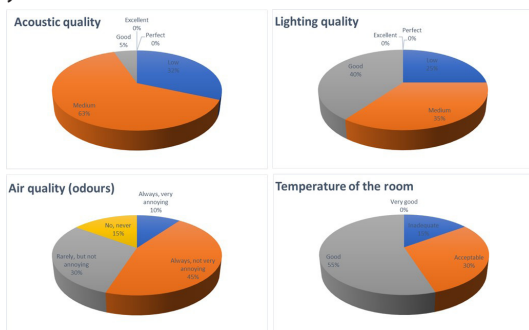


Fig. 2: Pie charts of the results of the questionnaire distributed ante-operam, concerning the section of environmental quality (acoustic quality, lighting quality, air quality, temperature of the room)

### 3.3. The design of acoustics and global comfort in Fratelli Briganti's Restaurant

The project was then designed and defined starting from the observations collected through the Customer Satisfaction questionnaire, together with the results of acoustics, lighting and thermal measurements carried out on site. From the architectural point of view, the preferences of the owners of the business to maintain the identity which characterizes the dining rooms have been taken into account. According to the aesthetic choices of the client, materials and furniture, functional to the project, have been identified and distinguished for each of the room. The overall solution and all the designed elements are integrated into the atmosphere of the restaurant, thanks to the choice of natural wood fibre.

For the acoustic intervention in the main room, a false ceiling has been installed and equipped with sound-absorbing panels, considering the low height of the rooms. The finishes are characterized by a rustic style. It was decided to maximize the porous sound-absorbing material on the ceiling, as the client preferred not to treat other surfaces except for it. This intervention allowed the reduction of reverberation time, with

the consequence of the optimization of the intelligibility of speech.

According to the results of the questionnaire, the lighting of the rooms was defined as „poor“ by a quarter of the interviewees. In this regard, two types of lighting were provided: linear elements for diffuse lighting and spotlights for directional lighting. The two options were necessary as the configuration of the tables in the main dining room is not fixed and therefore it was not possible to define a targeted lighting system. Strips of LED lights are placed on non-structural wooden beams, hung with steel wires to the ceiling. Linear lights face upwards for diffuse lighting, which allows distribution and avoids the formation of sharp shadows and can also be adjusted in intensity, especially according to the variable external lighting. The punctual elements are distributed on the beams with regular pitch and equipped with a wide opening angle, for more specific lighting of the tables. In the main room, there is a fixed counter for drinks and sales where a row of directional lights has been arranged. On the other hand, wall-mounted spotlights have been placed in the small room.

For the thermal system, the intervention consists of the positioning of an air conditioning system that allows regulating the temperature in an optimized way, both in winter and summer. The airflow is channelled through micro-perforated copper pipes. An alternative solution has been defined for the kitchen, where the need to ensure an adequate extraction of fumes has required a new hood.

Some of the interventions aimed at improving the Global Comfort for the renovation of the „Fratelli Briganti Restaurant“ are shown in Fig. 3.



Fig. 3: Some pictures of the post-operam configuration of Fratelli Briganti's Restaurant, Florence

### 3.4. Customer Satisfaction Survey distributed post-operam

At the end of the renovation of the dining rooms, the Fratelli Briganti's Restaurant has been reopened and the same Customer Satisfaction questionnaire has been distributed to 40 patrons. The contents of the questionnaire remain unchanged, as



presented in Tab. 1. This survey allows comparing the pre- and post-intervention results, thanks to the fact that half of the subjects consists of regular customers. The outcomes show a general improvement of the comfort conditions.

After the intervention, the acoustic comfort has been assessed as „excellent“ by 43% of the sample, whereas none has selected this option in the ante-operam phase. If the „good“ statement is also included, the appreciation of acoustic comfort goes from 5% (before) to 90% (after).

Excellent ratings have been gained for lighting comfort (from 0% in the ante-operam phase to 68% in the post-operam one), as well as for thermal comfort, where the “good” and “very good” choices went from 55% (ante-operam) to 92% (post-operam). A decrease is observed for the negative assessments of the perception of odours, which varied from 55% to 3%.

Even the quality of food and the cleaning have been more appreciated after the intervention rather than before it, although these aspects are not directly correlated with the interventions carried out. Noticing that the floor has not been replaced and the furniture has maintained its position, it may be stated that the perception of the overall pleasantness and the quality of the environment affect even categories that have not been subject to change. Regarding the overall experience, scores from 8 to 10 have increased from 30% (ante-operam) to 88% (post-operam).

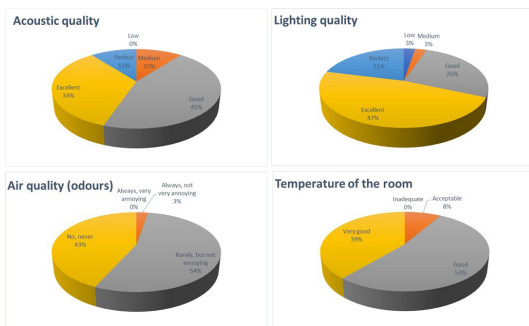


Fig. 4: Pie charts of the results of the questionnaire distributed post-operam, concerning the section of environmental quality (acoustic quality, lighting quality, air quality, temperature of the room)

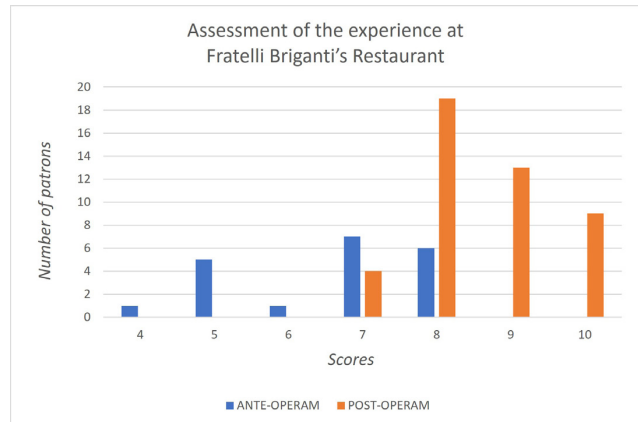


Fig. 5: Pie charts of the assessment of the experience at the Fratelli Briganti's Restaurant, related to the outcomes of questionnaire distributed in the ante- and post-operam phases

As a confirmation of the effectiveness of the solutions adopted, a few months later, the owners of the restaurant required a similar acoustic intervention in the small room, in the light of the positive results observed in the main room.

#### 4. CONCLUSION

Considering “eating out” as a multisensorial experience, the design of restaurants demands to include many aspects related to global comfort. Restaurants are spaces indirectly intended for speaking and listening, therefore, limiting background noise is one of the aims of aware design. The latter involves the consequent ease of communication between diners and good intelligibility of speech.

Low acoustic quality, together with poor lighting, presence of bad odours, and thermal discomfort can easily determine conditions of unpleasantness that make it difficult to fully enjoy the convivial spaces.

The perception of well-being is multisensory and linked to other subjective factors so that all the five senses contribute positively or negatively to pleasantness.

In the light of the current pandemic context, the conclusive considerations go to how the constraints will have changed our social and convivial lives after this peculiar period. Two possible paths may be marked: on the one hand the desire to return to pre-Covid conviviality with high levels of noise, on the another a renovated awareness of people, who want to save the new good habits to resist the risk of contagion.

New approaches will emerge by managers and new needs of patrons to follow the different way of eating out.

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