

**ERGONOMIC ANALYSIS OF SEATING FURNITURE
USED IN FOOD AND BEVERAGE FACILITIES: THONET
NO: 233 CHAIR**

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Abstract-As all of the tourism facilities, it is important to make the customers comfortable in food and beverage facilities during the service.

Presented by the master carpenter, pioneer of mass furniture production with industrialization, Michael Thonet and later by Gerbrüder Thonet Company, known as Thonet chairs, has drawn attention as a common product.

The chair in our study is preferred in café which developed under the influence of French culture, unlike fast food facilities. Therefore, the chair should design so as not to force people during a few hours sitting.

The study examines the relationships between human and no: 233 first produced by Gerbrüder Thonet in 1895 used in mentioned places. For this purpose, an ergonomic examination of the chair was carried out by evaluating some standards with chairs qualities.

Results show that the use of this chair, which has a widespread use on the world scale, in food and beverage facilities is preferable for people. The study is expected to lead to the ergonomic analyses of other used Thonet chairs in food and beverage facilities.

Key Words- food and beverage facilities, seating furniture, ergonomics, Thonet.

YIYECEK VE İÇECEK İŞLETMELERİNDE KULLANILAN OTURMA MOBİLYALARININ ERGONOMİK AÇIDAN İNCELENMESİ: THONET 233 NUMARALI SANDALYE ÖRNEĞİ

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Özet- Turizm sektöründe yer alan tüm işletmelerde olduğu gibi, yiyecek ve içecek işletmelerinde de müşterilerin hizmet sürecinde rahat etmeleri oldukça önemli görülmektedir.

Sanayileşme ile birlikte seri mobilya üretiminde çığır açan mobilya ustası Michael Thonet ve sonrasında Gerbrüder Thonet Firması tarafından sunulan ve Thonet sandalyeleri olarak anılan model yaygın bir ürün örneği olarak dikkat çekmiştir.

Çalışmamızda incelemiş olduğumuz sandalyenin, “ye-kalk” olarak ifade edilen ve hızlı hizmet sunan gıda işletmelerinin dışında, Fransız kültürü etkisinde gelişen “café”lerde tercih edildiği, bu nedenle söz konusu sandalyenin birkaç saatlik oturma sırasında insanı zorlamayacak bir biçimde tasarlanmış olması gerekmektedir.

Çalışmanın amacı, yiyecek ve içecek işletmelerinde kullanılan oturma mobilyalarından Gerbrüder Thonet firmasının 1895 yılında ilk kez ürettiği 233 numaralı sandalyenin insan ile arasındaki ilişkinin incelenmesidir. Bu doğrultuda, bazı standartlar ve sandalyenin nitelikleri göz önüne alınarak ergonomik bir inceleme yapılmıştır.

Araştırmanın sonucunda, Dünya ölçeğinde oldukça yaygın kullanımı olan bu sandalyenin, yiyecek ve içecek işletmelerinde kullanımının insan açısından tercih edilebilir olduğu görülmüştür. Araştırma, yiyecek ve içecek işletmelerinde kullanılan diğer Thonet sandalyelerinin de ergonomik açıdan sorgulanmasının gerekliliğini ortaya koymaktadır.

Anahtar Kelimeler- Yiyecek ve içecek işletmeleri, oturma mobilyaları, ergonomi, Thonet

1. INTRODUCTION

In food and beverage facilities, sitting furniture is an important element to perceive and usage of these places. People who come to these places as customers use the seating furniture, actively. The restaurants and cafes where people go with eating and recreation intentions are the principal food and beverage facilities. Sitting in a chair for hours gives a certain level of fatigue in people. People need comfort in certain standards. A comfortable seating area and furnishings are also a

natural expectation of customers, as much as food drinks and other offered services by the facilities.

According to GURSOY, today's cafes have started to be established in France in the 1600's and spread to all over Europe. Initially, coffee, cocoa, and wine were served in cafes as well as mild alcoholic beverages. In France in 1760, during the 15th Louis period, Boulanger opened shops offering his soup of good for health, very nutritious and gave them the name "restorers", which meant "restoring" (refreshing, giving liveliness). The word "lokanta" used in Turkish derives the same origin with "locanda" that derives from "local" [1].

Non-domestic dining places known to be as a meal center in the 1800's; "aşçı" and "aşçı dükkânı". These places have become Western-style restaurants after the establishment of the republic. However, we see the places called "aşçı" or "aşevi" until the 1960s [2]. Many of these types of eating places are named as restaurants today.

Gebrüder Thonet Company is the owner of the license of Thonet no: 233 chair which is one of the seating furniture used in the food and beverage facilities. This chair was produced prevalently and continued to be produced in Turkey, today.

2. METHOD

The seating and reclining surfaces that the human weighs his/her burden on, affect human health and comfort, directly. One of the reasons of the diseases of the muscles and skeletal system is the wrong way of sitting.

Anthropometry is a science that deals with the dimensional qualities of the body. Anthropometric criteria predict that the users should have dimensional suitability when interacts with the product [3].

One of the criteria for sitting furniture to be ergonomic is that whether it suits with the user's anthropometric measurements and characteristic.

Seat height, seat width, seat depth, seat pan contours and form of the backrest, affect directly ergonomics of modules composing the chair. Mentioned values based on various determined standards.

Another criterion is material properties. For this reason, the ergonomic characteristics of the materials composing the chair have studied. The ergonomic nature of the chair has studied with these criteria and other preference reasons.

3. FINDINGS

3.1. The Historical Evolution of the Thonet No: 233 Chair

The legs and the armrests supports of the studied chair made of solid steam-bended beech. The armrest support and the legs of the chair, produced by bending beech with steam. This technique was developed by Michael Thonet under the influence of the industrial revolution innovations in 1830.

Michael Thonet established the Gebrüder Thonet which is an Austrian furniture company with his five sons in Vienna, in 1853 [4]. The chairs produced with Thonet's technique seen as the pioneer of mass furniture production. It has pioneered mass furniture production with a chair that

can be easily demountable, packaged and transported. In addition, it was more economical to produce curved forms with a single piece timber.

The most common model of Gerbrüder Thonet Company is chair number 14. In addition to this, the company has different chair models with material variations which are preferred in many places, especially in cafes. On the other hand, chair No: 233 is a timeless design often preferred in our country in recent years.

Maison Psalty which has four stores in Tunnel in 1893, in Tepebasi, Istiklal Street and Galata in 1913, is known to import the Thonet chair from Austria [5]. Another importer is Maison Baker. One of the earliest sources that we can see Thonet 233 chair is the advertising brochure of the Maison Baker furniture store.

According to Hortaç, there were limited numbers of productions for Thonet No: 233 in the 1960s [7]. After the 1990s, the production of the bentwood chair has begun and continues widely. Parts of the Thonet No: 233 that were imported mounted in our country.



Figure 1. Furniture from Istanbul Baker's commercial catalog, 1910 [6]

3.2. Anthropometric Data and Form and Material Properties Used in Examining of Thonet No: 233

Thonet No: 233 is produced with different colors and material options. The chair also has a metal leg and a metal armrest support option. The backrest's material can be solid wood or plywood. The original seat is solid wood, also can be seen as coated leather or fabric.

The height of the seat is 46 cm as seen in Figure 2. The seat width is 56 cm, the seat depth is 53 cm, and the height of the backrest is 77 cm.

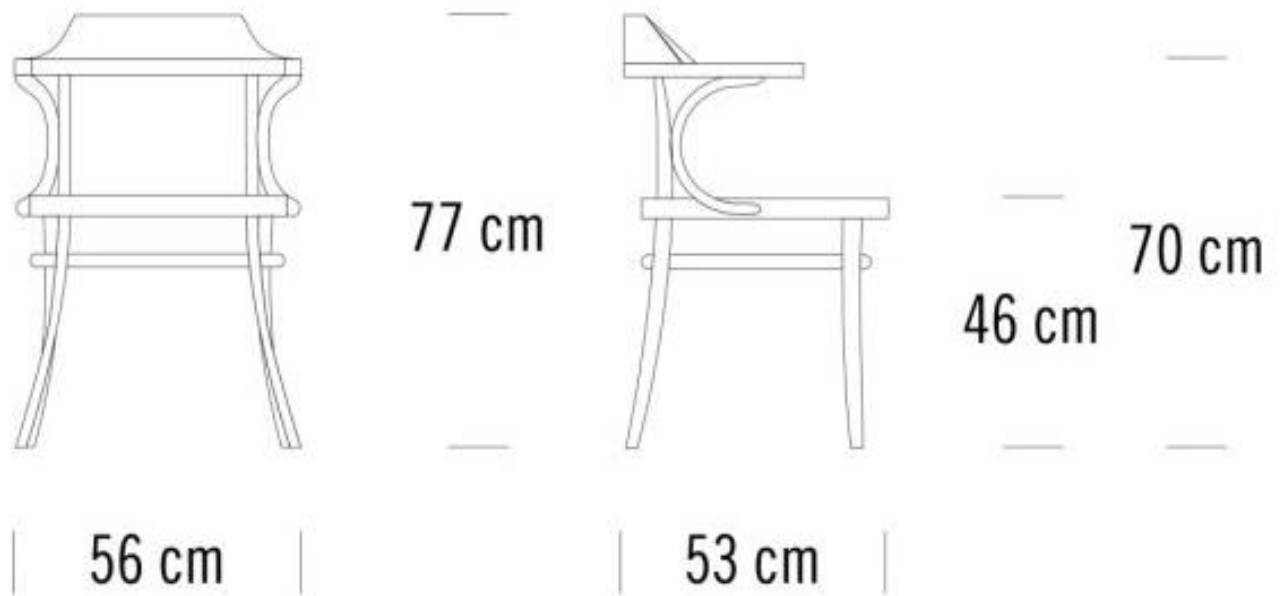


Figure 2. Thonet No: 233 chair product dimensions.
Reference: Thonet GmbH [8]

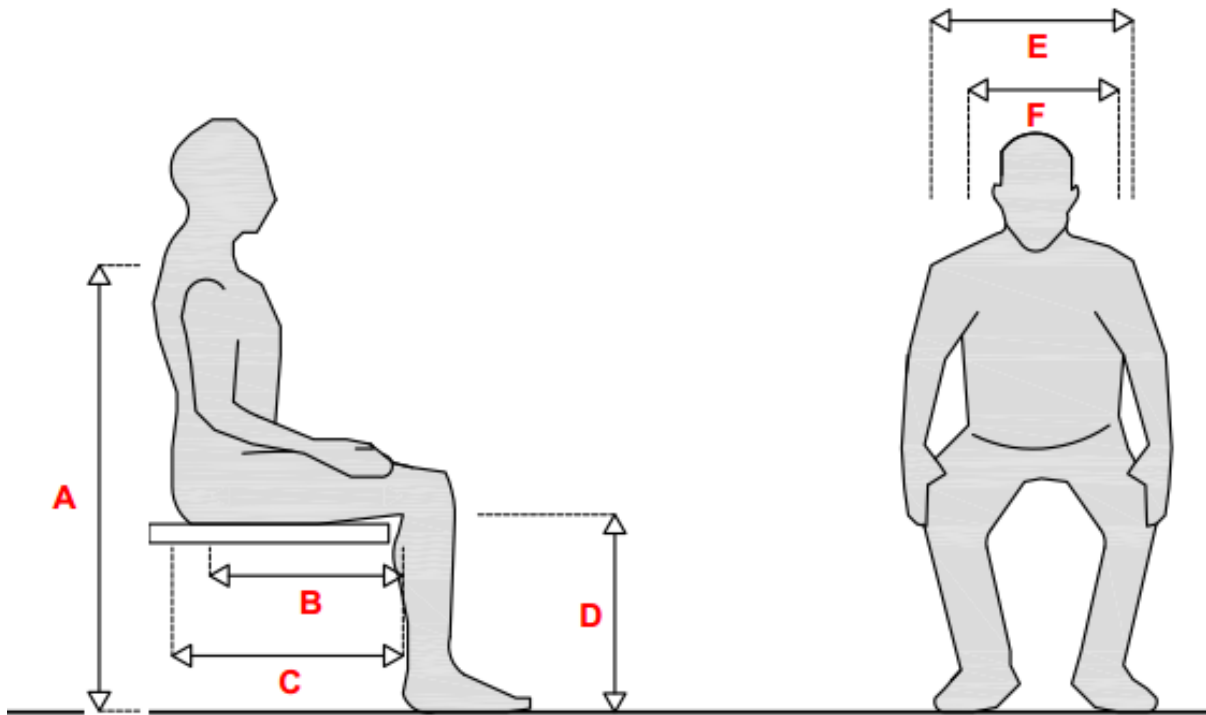


Figure 3. Schematic drawing of certain important human dimensions for designing sitting furniture

Static anthropometric data is essential in designing of the sitting furniture. Anthropometric Dimensions of Anatolian People, according to results of anthropometric data were collected from 2100 individuals determined by Turkish Statistical Institute (TURKSTAT) [9]:

Table 1. Anthropometric dimension of Turkish men and women, descriptive statistics, and selected percentile values

	%5		Average		%95	
	Men	Women	Men	Women	Men	Women
A: Shoulder height	82.5 cm	77.5 cm	88.7cm	82 cm	94.6 cm	93.5 cm
B: Elbow-fingertip length	41.7 cm	41.6 cm	47.5 cm	46.4 cm	56.2 cm	54 cm
C: Buttock-popliteal length	46.8 cm	49 cm	55.7 cm	54.8 cm	61.3 cm	60.5 cm
D: Popliteal height	48 cm	44.8 cm	52.2 cm	47.7 cm	56.8 cm	55.8 cm
E: Shoulder breadth	35.5 cm	33.4 cm	39.3 cm	36.1 cm	43 cm	42.3 cm
F: Hip breath	27 cm	26.6 cm	31.2 cm	30.9 cm	35.2 cm	35.7 cm

Value A in Table 1 is used measure the backrest height. B and C values are used for the seat depth; D value to measure to the seat height, the value of E is useful in finding the width of the backrest. The F value is hip breath used for seat width.

These dimensions and the following standards were considered to ergonomic analyses.

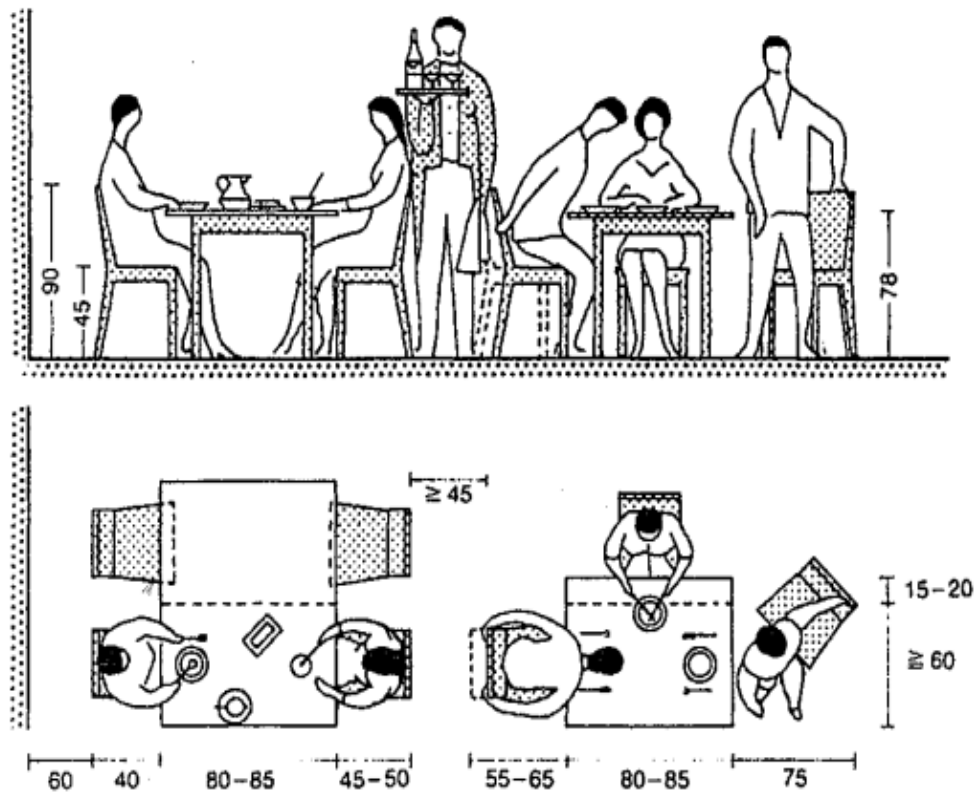


Figure 4. The dimensional data of the sitting furniture and area in restaurants for users [10]

As shown in Figure 4, according to the standards of German architect Ernst Neufert the seat width must be 45-50 cm. The ideal value for the seat height is 45 cm, and the height of backrest of the chair stated as 78 cm [10].

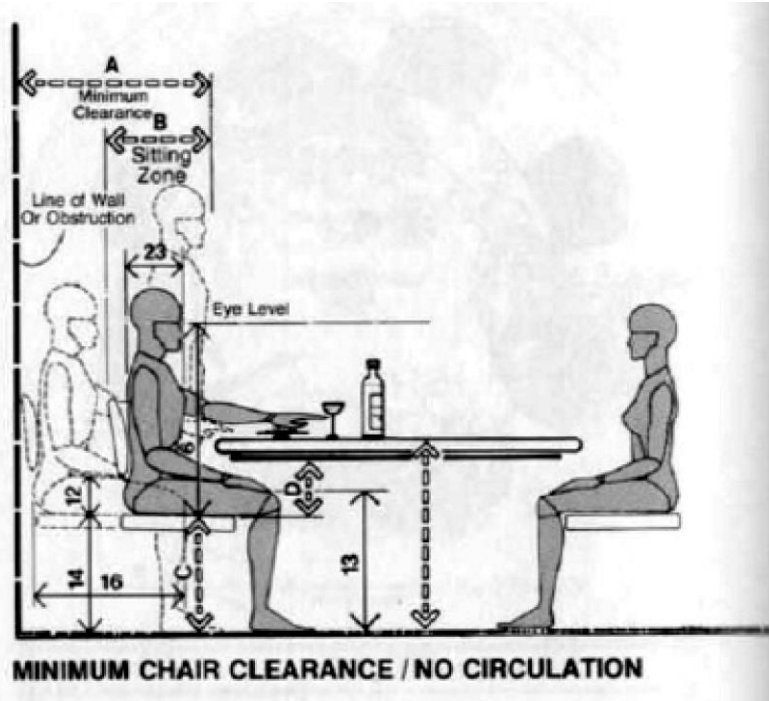


Figure 5. Dimensional data for furniture in food and beverage facilities [11]

Table 2. Measurement equivalents of dimensional data for furniture in food and beverage facilities [11]

	in	cm
A	30 - 36	76.2 - 91.4
B	18 - 24	45.7 - 61.0
C	16 - 17	40.6 - 43.2
D	7.5 min	19.1 min.
E	29 - 30	73.7 - 76.2
F	48 - 60	121.9 - 152.4

According to the accessibility standards seen in Figure 5, the dimension B is the seat depth. It is 45.7-61 cm. The dimension C is the seat height. According to these standards, this must be approximately 40.6- 43.2 cm in the range. The distance must be behind the chair while sitting is A. It must be 76.2-91.4 cm [11].

3.3. General Evaluation of Thonet No: 233 Chair

The primary material of the chair is wood and wood-based material. Referring to being a warm material, aesthetic value of wood both with the physiological and psychological effect described as charm and beauty, and made it a select material that indispensable part of our life from the past to present (and even future) [12]. Wood material makes human feel the sense of confidence. This situation leaves a positive impression on the customer in the place, and both the business

owner and the customers benefit from it. Tube bent metals in some examples do not change the effect of the wood that constitutes the main characteristic of the chair.



Figure 6. Use of Thonet No: 233 chair in a cafe [13]

In this example, the material of black bent pieces in the armrests of the chair is painted metal [13].

The Thonet chairs have become the symbol of the coffee houses which were raised and spread in France in the 20th century. By designers of the place, it is possible to make the users feel the coffee culture about the place. However, the restaurants use the Thonet 233 chair is sometimes not organized for coffee service purposes. In Europe, cafes that derive from Ottoman coffee houses have evolved into a different format over time. The history of the café culture developed under the Western influence is very new to the Turkish society. The widespread usage of these chairs may be related to this in the restaurants.



Figure 7. Use of painted samples of Thonet No: 233 chair in a restaurant [13]

3.4. Ergonomic Analysis of Thonet No: 233

Various elements are efficient in a physically healthy sitting. Sitting should be convenient in the social and cultural context. For this purpose, the visual and form characteristics of the design, the materials, and the production technique must be considered by effects on the people.

3.4.1. Seat Height

The ideal seat height is a changeable value. This is because of direct relations of the value to anthropometric data. Anthropometric data are values that can vary in communities, generations, and years. Cafes and restaurants naturally have a non-homogenous customer mass. Determined individuals that anthropometric data have collected from have considered as the potential users of the food and beverage facilities.

The seat height for eating sitting down must be adjusted as that the feet can lean back and the user can comfortably accommodate [15]. The seats are required to be adjustable independently of each other in the horizontal and vertical plane. This is because an exact rate between the seat height and the buttock-popliteal length cannot be determined. [16].

The importance of furniture that provides flexible and dynamic sitting for office and similar environments has proved in recent years [17]. The seat height is adjustable in most of these products. These chairs are preferred mostly in offices, and they cost higher than non-adjustable sitting furniture. Moreover, they can cause non-economic consequences to business owners because they take the more space. Because smaller sitting furniture allows hosting more customers in limited space.

The seat height of the chair in this study is 46 cm which is approx. 45 cm in Figure 4 but exceeds it.

When the anthropometric data has examined in Table 1, the seat height of the chair is higher than the dimension 44.8 cm of women. However, it has seen that is suitable with the popliteal height of men.

The seat height is a value exceeding the range of 40.6-43.2 cm, according to the standards seen in Table 2 when the chair has produced with the original dimensions.

3.4.2. Seat Width

As shown in Figure 2, the seat of the studied chair is 56 cm in width. According to the dimension given in table 1, the widest value is 35.2 cm in men and 35.7 cm in women. The seat width of the chair is suiting with anthropometric data.

3.4.3. Seat Depth

As shown in Figure 2, the seat depth of the chair is 53 cm. This value exceeds 5% and the average user size for both men and women considering the buttock-popliteal length given in Table 1.

The seat depth (B) is between 45.7 cm and 61 cm, which has seen in table 2.

The average size of the chair depth is approximately 40-45 cm, given in Figure 4. The seat depth of the chair also exceeds it.

3.4.4. Seat Pan Contours

The seat must have a specific inclination, which is comfortable for the hip bone. The seat has an inclination in examples of Thonet No: 233 with wooden seat.

Non-wood examples have a leather coated seat, comfortable for the user more than a chair with a flat seating area.

3.4.5. The Height of the Backrest

The backrest height is 77 cm, is shorter than the shoulder height of users. It has concluded that the furniture may be suitable for Anatolian people, considering anthropometric data of Anatolian people in 2005, determined standards and furniture dimensions.

3.4.6. Other Ergonomic Findings

In food and beverage facilities, another important factor is the size of the table that used. In addition to being suitable for dimension and qualities of the chair, the height of the dining area must also be compatible with the chairs.

Anthropometric data can fundamentally change in years and depend on samples. In examples with upholstered seat, seat height can change depending on the weight of the user.

Use of backrest and mobility in posture is important for the health of the lumbar region. Contact with the backrest help to decrease lumbar pain [17]. The presence of a backrest with inclined form encircles the back increases the comfort of the user. In addition, this back brace supports the arms and also allows users to long-term sitting.

4. CONCLUSION AND DISCUSSION

The feet and other bent elements were originally made of wood and then made of steel, shows the evolution of the furniture.

The seating area of the furniture is high according to the general dimensions and standards. Therefore, the majority of users may not be able to contact the ground with their feet. It causes an uncomfortable seating condition in the seat height.

Anthropometric data gives an opinion about physiological compliance with the user [18]. Also, it has used for evaluating the suitability of the furniture to psychological factors of users. People have used the wood for centuries. Because of being the main material of furniture, wood makes it warm and familiar. The furniture, which is composed of simple forms, can adapt to both classical and modern places. This situation has a positive impact on the atmosphere of the space.

The sitting furniture with big armrests, which is the same as an armchair has often seen in eating and drinking facilities, recently. These furnishings have a limiting effect in the place organization because of their weight and the space they take. The dimensions of the furniture allow flexible positioning. Furniture must be grasped easily and be moveable for making changes in the organization of space easily, depending on changing number and requests of customers. The upper side of the backrest of Thonet No: 233 is available for grasping, and it makes the furniture moveable.

All licensed products of Michael Thonet and Gerbrüder Thonet are becoming universally widespread. Because of a large number of people are spending time on these chairs in food and beverage facilities every day, it is necessary to analyze the ergonomic of Thonet chairs that have universalized away from the cultural context.

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