ANTHROPOMETRIC ANALYSIS OF CABIN CREW SELECTION CRITERIA BASED ON A380 AIRCRAFT MODEL

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Keywords	Abstract
Cabin crew *Cabin crew selection* *Anthropometry* *A380 aircraft model* *Aviation*	*Airline companies use specific selection criteria for cabin crew to ensure that candidates meet their physical requirements. Some of these criteria are the height and reach distance of the candidates. This selection criterion is designed so that cabin crew can effectively perform tasks such as being able to master emergency equipment, have access to upper storage compartments and assist disabled or injured passengers. The aim of this study is to examine the height and reach distance requirements, anthropometrically according to the A380 aircraft model. The study examined anthropometric studies conducted in Qatar Airways, Singapore Airlines, Emirates, All Nippon Airways, and Qantas Airlines and provided the collection of height and reach distance data of the people in these countries under a single roof and determined the status of A380 aircraft model. As a result of the research, it is recommended that airline companies use standardized anthropometric measurement parameters in the selection of cabin crews.*

KABİN MEMURU SEÇİM KRİTERLERİNİN A380 UÇAK MODELİNE GÖRE ANTROPOMETRİK İNCELENMESİ

Anahtar Kelimeler	Öz
Kabin ekibi *Kabin ekibi seçimi* *Antropometri* *A380 uçak modeli* *Havacılık*	*Havayolu şirketleri, adayların fiziksel gereksinimlerini karşılamasını sağlamak için kabin ekibi için özel seçim kriterleri kullanır. Bu kriterlerden bazıları adayların boy ve uzanma mesafesidir. Bu seçim kriteri, kabin ekibinin acil durum ekipmanlarına hakim olabilme, üst saklama bölmelerine erişebilme ve engelli veya yaralı yolculara yardımcı olabilme gibi görevleri etkin bir şekilde yerine getirebilmesi için tasarlanmıştır. Bu çalışmanın amacı, A380 uçak modeline göre yükseklik ve erişim mesafesi gereksinimlerinin antropometrik olarak incelenmesidir. Qatar Airways, Singapore Airlines, Emirates, All Nippon Airways ve Qantas Airlines'ta yapılan antropometrik çalışmaların incelendiği çalışmada, bu ülkelerdeki kişilerin boy uzunluğu ve erişim mesafesi verilerinin tek çatı altında toplanması sağlanmış ve A380 uçak modelinin durumu tespit edilmiştir. Araştırma sonucunda havayolu şirketlerinin kabin ekibi seçiminde standardize edilmiş antropometrik ölçüm parametrelerini kullanmaları önerilmektedir.*

1. Introduction

With an impressive length of seventy-three meters, the A380 aircraft model can be said to be the largest passenger aircraft in the world. This length provides several advantages for airline operators. This aircraft model provides ample space for seat arrangements to accommodate first-class passengers on long-haul flights. In addition, the length of the A380 aircraft model allows for a variety of cabin configurations to meet specific customer needs.

Airline companies apply specific selection criteria in the selection of cabin crew to ensure that they meet the physical requirements of the job. One of these criteria is the height of the candidate and the distance to reach. This selection criterion is designed to guarantee that cabin crew can effectively perform tasks such as dealing with emergency equipment, reaching the upper storage compartments, and assisting disabled or injured passengers. Height and reach requirements may vary between different airlines, and international aviation organizations only advise on this. It is important for airlines to set clear and specific physical selection criteria so that only suitable candidates are hired, and safety standards are maintained throughout all flights. In addition, setting such physical selection criteria helps to reduce the risk of accidents or injuries that may occur due to the inability of cabin crew members to perform their duties effectively.

The aim of this study is to examine the height length and reach requirements, which are among the cabin crew selection criteria, anthropometrically according to the A380 aircraft model.

2. Literature Review

2.1. Cabin Crew and Duties

In the civil aviation industry, cabin attendants are an important member of the cabin crew. Cabin attendants are employees other than the cabin crew who provide the specified needs for the comfortable, safe, and secure completion of the flights by the necessary institutions for the safe and secure operation of the flights, whose duty places are the cabins of the aircraft in which passengers are transported and who have successfully completed their training and have the cabin crew certificate (SHGM, 2023a).

Cabin crew refers to the employees whose main duty is the cabin of the aircraft and who ensure the safety and needs of the passengers, except for the cockpit crew, in performing the duties and responsibilities required during the flight. In addition, basic and refresher trainings must be taken in order to take part in the cabin crew. With the certificates earned because of these trainings, you can start to work as a

cabin crew (SHGM, 2023b). Cabin crews are governed by three different regulations. These regulations are the "Regulation on the Preparation of National Occupational Standards" issued through the Vocational Qualifications Authority (VQA) is the "Regulation on the Establishment, Duties, Working Procedures and Principles of the Sector Committees of the Vocational Qualifications Authority" and the decisions of international aviation organizations (MYK, 2012).

Cabin Attendants are the visible face of the civil aviation enterprises that have the most communication with the passengers and are the civil airline personnel defined by the laws and who have successfully completed their qualification training and received the "Cabin Crew Certificate". Cabin attendants, who are also referred to as "Aircraft Cabin Crew" in their job descriptions, have responsibilities such as ensuring flight safety and security according to aviation rules (MYK, 2012; IATA, 2017). Cabin crew; consists of three people as cabin crew chief, cabin attendant and cabin crew member. These are briefly mentioned below.

- Cabin Crew Chief: Cabin crew are the personnel responsible for cabin services who are present as part of crew resource management during the flight operation. The cabin crew chief is the manager and administrative leader of this crew. The cabin crew chief is the person who has the experience and knowledge required by law and is responsible for the management, guidance, and coordination of the cabin crew during the flight (SHGM, 2023b). The cabin crew chief is responsible to the captain pilot during the flight for the management and coordination of the crew in the fulfillment of their duties and responsibilities. In order to be able to work as a cabin crew chief, it is necessary to have worked as a cabin attendant for a minimum of five years and to have a "Cabin Crew Chief" certificate by successfully completing cabin crew training. The duties of cabin crew chiefs include safety, security, leadership, communication and ensuring that cabin services are performed on time and in accordance with procedures. They also supervise the catering throughout the flight in accordance with the established standards (SHGM, 2023a).
- Cabin Attendant: Cabin attendant refers to cabin crew who have responsibilities to the captain pilot and cabin chef, who are in charge of the safety of the flight in normal and emergency situations in accordance with national and international decisions, and who have the relevant certification levels (SHGM, 2023a).
- Cabin Crew Member: With the increase in competition in the aviation industry, professional experts are also included in cabin crews with the aim of improving service quality. For example,

cooks assigned for long-haul flights serve as one of the crew members (SHGM, 2023b).

2.2. Cabin Crew Selection Criteria

Scientific studies on human resource planning and management emerged in the first years of the 20th century. After the First World War, the increase in enterprises in the sector and the structural changes experienced brought the need for qualified labor force to the agenda and revealed the importance of human resources planning and management. In order to use the advantages of the developing competitive environment, it is aimed to support and maintain the objectives of the enterprises in the sector and to ensure that they can maintain their strategies. Human resources factors are the focus of sources that support empirical evidence that the most valuable resource of businesses is human (Alles and Rodríguez, 2009). Human resources contain many categories together and their contents can be stated as listed below (Kusluvan et al., 2010):

The personality and emotional intelligence of the employee,

- Emotional and aesthetic labor,
- Human resources management practices,
- Internal marketing,
- Organizational culture and climate,
- Attitudes and behaviors of employees,
- Business strategies.

In addition, considering that the airline sector is a service sector, the importance of cabin crew's personalities, emotional intelligence, proactivity, harmony with their teammates, and communication with passengers is well analyzed by human resources units in recruitment and it becomes important to ensure the employment of qualified labor force.

The compatibility of work and occupational situation is especially important for psychological and physical well-being. The compatibility of psychosocial factors is the focal point in the interaction between the person and the environment. In particular, factors affecting the world such as health and terrorism directly affect the aviation sector. Such environmental factors affect those working in airline businesses, especially cabin crew members. Increasing security measures in the airline sector have made it compulsory for cabin crew to receive training on many subjects such as medical aid training, directing evacuation, handling, controlling, and managing devices with explosion risk, and keeping unruly passengers under control. The responsibilities and workload of cabin crew members have increased with the continuous updating and increase in the trainings they receive. The first and most important duty of cabin crew is to

ensure the safety and security of passengers. When service duties take precedence over safety duties, it may cause profound consequences. Achieving this balance and eliminating passengers' misperceptions is one of the duties of airline operators (Kelleher and McGilloway, 2005). Especially for the workforce profile mentioned below, the stages of human resources functions are of immense importance in order to reveal the qualified workforce.

Therefore, the quality of the workforce is extremely important in the success or failure of businesses. In order to determine the quality of the workforce, especially the needs of airline companies for qualified workforce become important. This is possible through human resources planning. Human resources planning is referred to by different names such as workforce or employment planning. The most crucial factor in human resources planning is that labor supply and labor demand are compatible with the activities of enterprises (Arslan, 2012; Ağırkaya & Keleş, 2022). The functions of human resources for the workforce profile can be stated as follows (Akduman & Karahan, 2021):

- Pre-selection: In the pre-selection, the most suitable people for the position among the job postings are evaluated. Pre-selection is made through online applications to airline operators.
- Test application: General ability or intelligence tests required by the job position are applied for the unit needed. Those who are successful in the written-oral exams in English conducted on the internet in airline companies are invited to the interview.
- Interview: These are the interviews with the candidates to see whether the candidates are suitable for the position and to analyze them. Airline operations usually have one-on-one, group, and English interview stages.
- Reference check: A reference check is carried out in which at least two references are indicated in order to see the work experience of the candidates and to get their past experience. In the interview with the candidates in the airline companies or afterwards, the references or work experiences are checked in the requested documents and the recruitment decision stage is started.
- Recruitment decision and job offer: Candidates who have successfully completed the above-mentioned processes are selected because of the evaluations of human resources and relevant department managers. Health checks are carried out with the job offered to the selected candidate.
- Health checks: Upon accepting the job offer, candidates are asked to report on their health to see if they can perform as required by the position. After the health check, cabin crew candidates start their cabin services training determined by airline companies.

The functions specified in the Human Resources recruitment criteria have a direct impact on the improvements in training activities. In other words, the selection of the total workforce, the placement of the selected workforce in the right position and the training process constitutes all the human resources functions. Airline operations, which aim to provide competitive advantage, have gained speed with technology in structural changes in human resources. Online applications, interviews, interview processes, test applications can be given as examples.

The rapid changes in Civil Aviation have led to the emergence of a competitive environment, and the employee profile of airline enterprises has also undergone changes in this competitive environment with the cabin attendant being the most important personnel who will make a difference in an airline business, airline companies have updated their recruitment criteria every year and hired candidates with the best profile to meet the expectations of customers (passengers). For the cabin crew profile required by the aviation sector, institutions in Turkey and in the world, provide trainings with the orientation planning within their own structures after the recruitment process (Yasemin & Erdağ, 2021).

During the flight, cabin crew have many duties and responsibilities. When evaluated in terms of service time, these duties and responsibilities can be defined as before, during and after the flight, respectively. In addition, these duties and responsibilities can be managed within the scope of service quality and flight safety. With the established procedures, the duties and responsibilities of cabin crews are decided. The institutions that establish the procedures are "International Civil Aviation Organization" (ICAO) and the "Directorate General of Civil Aviation" (DGCA). In addition, the success of flight operations is the responsibility of cabin crew. For the aforementioned reason, there are certain tasks and measures that need to be carried out in order for a successful flight to take place. These can be listed as follows (SHFM, 2023b):

- Follow-up of the negativities that may arise in the cabin and notifying the flight responsible,
- Observing the risks in the cabin and reporting movements that may affect safety,
- Observing and preventing illegal movements that are determined by law and that may occur in the cabin,
- Prevention of incidents that may put the safety in the cabin at risk before, during and after the flight.

The above duties are assigned to cabin crew for the purpose of ensuring cabin safety, except for in-cabin refreshments. All cabin attendants are responsible for performing the specified duties in a complete manner.

2.3. Cabin Crew Selection Criteria of the 5 Largest Airlines in the World

Each year, the London-based aviation research firm Skytrax releases a list that ranks the goods and services offered at airports. With its fleet of more than 200 aircraft and more than 150 significant business and entertainment locations worldwide served, Qatar Airways was recognized as "The Best Airline in the World" in the evaluations. With a combined passenger network encompassing more than 110 locations and a fleet of more than 180 aircraft, Singapore Airlines came in second. Emirates, with a current fleet of 262 aircraft and 152 destinations, comes in third. Emirates was the top international airline during the Covid-19 pandemic in 2020, with 15.8 million passengers. The list was followed by Japan Airlines, which covers 95 destinations and has a fleet of more than 230 aircraft, ANA All Nippon Airways, with 82 international and 118 domestic flights, Qantas Airways, with 31 international and 60 domestic flights (World Airline Awards, 2022).

Qatar Airways: Qatar Airways cabin crew recruitment criteria are as follows (Career Qatar Airways, 2023):
- Be at least 21 years old,
- There should be a 212 cm arm reach when standing on the fingertips,
- Minimum height should be 160 cm,
- To be a high school graduate (Class 12),
- Fluency in English written and spoken,
- No visible tattoos while in Emirates cabin crew uniform,
- Be able to adapt to new people, new places and new situations,
- With a healthy Body Mass Index (BMI), he must be physically fit for this challenging role.

Qatar Airways, another airline that works with multinationals, has a condition of residence in Doha, Qatar in its cabin crew recruitment criteria (Qatar Airways, 2023).

Singapore Airlines: Singapore Airlines is the second largest airline in the world. The company's criteria for hiring cabin crews are as follows (Singapore Airlines, 2023):
- Be a citizen of Singapore,
- Be at least 18 years old,
- Minimum height of 1.58 m for females and 1.65 m for males,
- To have a degree/diploma,
- 9th and 4th Stages Have GCSEs in grades (A* and C) or English and Math equivalents,
- Have good physical fitness,
- Have a normal color appearance,

- Have a valid passport without any restrictions for the destinations the airline travels to.

Emirates: Emirates cabin crew recruitment criteria are listed below:
- Must be at least 21 years old,
- There should be a 212 cm arm reach when standing on the fingertips,
- Minimum height should be 160 cm,
- Must be a high school graduate (Class 12),
- Must have written and spoken fluency in English,
- No visible tattoos while in Emirates cabin crew uniform,
- Be able to adapt to new people, new places and new situations,
- With a healthy Body Mass Index (BMI), he must be physically fit for this challenging role.

The minimum age criterion of twenty-one is remarkable. In addition, the English online exam, the requirement to search for written and oral English in a face-to-face interview is another remarkable point. Cabin crew candidates who successfully pass the interview process attend an 8-week English training course at Emirates' Aviation College in Dubai. Courses offered at Emirates Aviation College; Safety includes practical and theoretical methods of flight services with first aid (Emirates Group Careers, 2023).

ANA (All Nippon Airways): All Nippon Airways (ANA)'s cabin crew recruitment criteria are as follows (ANA, 2023):
- Must be over 20 years old,
- It should be at least 170 cm,
- It should have a weight proportional to the height of the application,
- The minimum arm distance should be 208 cm,
- Must be in excellent state of health,
- Must not have visible tattoos,
- Glasses should not be worn but contact lenses are allowed,
- Do not wear braces,
- Must have a bachelor's degree,
- Must have a good command of English,
- TOEIC score must be seven hundred points or more,
- Must have excellent interpersonal and communication skills.

Qantas Airways: Qantas Airways airline cabin crew recruitment criteria are as follows (Qantas, 2023):
- Minimum age of 18 years,
- The height range should be between 163 – 183 cm, for QantasLink it should be 158 – 183 cm,
- Must be a permanent resident of Australia or New Zealand and have a passport with at least 12 months validity granting unrestricted access to all Qantas ports of call,
- Have the legal rights to live and work in the UK,
- Must be healthy and fit, must be able to swim fifty meters with unassisted clothing, must be able to stay under water for 3 minutes,
- Have a current Senior First Aid Certificate valid for 12 months at the time of application,
- At the end of the recruitment process, the Responsible Service of Alcohol must be a "Success Statement", which you must have,
- Have a strong commitment to customer service with the latest experience in a face-to-face meeting,
- Show empathy towards people from various countries and cultures,
- Must be willing to move anywhere, when necessary,
- Must be experienced in food and beverage service,
- Must be fluent in one of the following languages: French, German, Italian, Spanish, Thai, Mandarin, or Cantonese.

2.4. Aircraft Models Used by the World's Top Five Airlines

The aircraft models, number and fleet statuses used by the world's top five airline companies are given below, respectively (Qatar Airways, 2023; Singapore Airlines, 2023; Emirates, 2023; ANA, 2023; Qantas Airways, 2023):
- Qatar Airways: A320-200 (29 units), A321-200 (1 units), A330-200 (6 units), A330-300 (8 units), A350-900 (34 units), A350-1000 (19 units), A380 (10 units) Boeing 787-8 (30 units), Boeing 787-9 (10 units), Boeing 777-200LR (9 units) and Boeing 777-300ER (53 units),
- Singapore Airlines: Airbus A330 (23 units), Airbus A350 (13 units), Airbus A380 (19 units), Boeing B747 (7 units) and Boeing B777 (53 units),
- Emirates: A380 (85 units) and 160 B777 (160 units),
- All Nippon Airways: Airbus A320 (11 units), Airbus A380 (3 units), Boeing 737 (11 units), Boeing 737-800, 33, Boeing 767-300 (16 units), Boeing 767-300ER (25 units), Boeing 77-200 (16 units), Boeing 777-200ER (12 units), Boeing 777-300 (7 units), Boeing 777-300ER (22 units), Boeing 787-8 (35 units), Boeing 787-9 (9 units), Boeing 767-300ERF (1 unit) and Boeing 767-300BCF (10 units),
- Qantas Airways: Airbus A330 (28 units), Airbus A380 (12 units), Boeing B737NG (67 units) and Boeing B747 (11 units).

3. Method

When the aircraft types owned by the world's five largest airline companies are examined, it is seen that all companies have A380 aircraft in their fleets like in Figure-1. Within the framework of the research, using this aircraft model, it was investigated why the cabin crew selection criteria of

the companies for the same aircraft model differed.

In this context, first of all, which anthropometric features are required within the framework of cabin crew selection criteria were examined. As a limitation of the research, it was seen that height and reach distance were determined as criteria without gender discrimination. It was seen that no other anthropometric feature was determined as a criterion for being a cabin crew.

Table 1. Cabin Crew Height and Reaching Distance

Airline Company	Country	Length (cm)	Reach Distance (cm)
Qatar Airways	Qatar	160	212
Singapore Airlines	Singapore	158-165	-
Emirates	United Arab Emirates	160	212
All Nippon Airways	Japan	170	208
Qantas Airways	Australia	163-183	-

It is seen that in Table 1, Emirates and Qatar Airways prefer cabin crew candidates with the highest reaching distance despite having the least height criterion. Singapore Airlines and Qantas Airways set an anthropometric criterion as reaching distance. All Nippon Airways, on the other hand, has set a criterion of 4 cm less in reaching distance despite having the highest height criterion.

In recent years, scientific and academic studies have examined whether the differences in cabin crew selection criteria for A380 aircraft in the world's five largest airlines are compatible with country-specific anthropometric characteristics. Taking into account the international status of these companies, the ethnic origins of the cabin crew were also evaluated, and examinations were made in accordance with anthropometric measurement standards.

3.1. A380 Inflight Parameters

When the technical documents of the Airbus A380 aircraft were examined, it was seen that there were five different models. The technical information of these models is given in Table 2, and it is seen that all aircraft sub-models have the same cabin length and fuselage diameters, which will be examined within the scope of the research.

Table 2. Airbus A380 Sub-Models and Their Specifications

Model	A380-700	A380-800	A380-800ER	A380-800F	A380-900
Length	67,90	72,70	72,70	72,70	79,40
Angle of Wings	79,80	79,80	79,80	79,80	79,80
Height	24,10 <	24,10	24,10	24,10	24,10 >
Cab Length	50,68	50,68	50,68	50,68	50,68
Stem Diameter	7,14	7,14	7,14	7,14	7,14

When the technical drawings of A380 are examined in Figure 1, it is seen that there are two different flight classes: tourist class and business class. When the cabin interior dimensions of these flight classes are examined in Figure 2, it is determined that there is no difference in corridor width, only the difference between the corridor width on the lower floor (0.55 meters) and the upper floor (0.51 meters) is 4 cm. Regarding the reaching distance, when the in-cabin baggage distances are analyzed, it is seen that the lower floor is 213 cm and the upper floor is 210 cm.
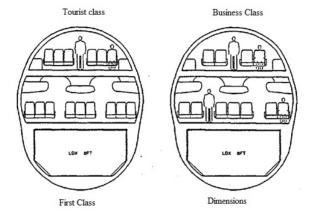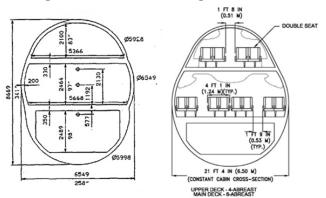

Figure 1. Technical Drawings of A380

Figure 2. Cabin Interior Dimensions of These Flight Classes

3.2. Anthropometric Data

By examining the anthropometric studies conducted in Qatar, Singapore, United Arab Emirates, Japan, and Australia, it was ensured that the height and reach data of the people in these countries were gathered under a single roof. Thus, A380 aircraft status was determined instead of country status.

Brocherie et al. (2014) examined the relationship between anthropometric measurements and athletic performance of athletes in the Qatar national football team. Hoffman et al. (2017) compared anthropometric and physical fitness between Australian and Qatari male sports school athletes. Forchino et al. (2016) examined the anthropometric data of thirty male athletes in Australia by examining their body in 3D. Chuan et al. (2010) measured the anthropometric data of 692 Singaporean and Indonesian individuals and Lee et al. (2019) measured the anthropometric data of two hundred individuals. Muthiah and Lee (2022) compared the anthropometric variables of 413 male cyclists from India, China, Singapore, and Taiwan. Mahmoud and Sulaiman (2021) examined the relationship between anthropometric measurements and obesity in 3531 adults in the United Arab Emirates. Sales et al. (2014) described the anthropometric and physical fitness profiles of twenty-seven elite soccer players in the United Arab Emirates. Lin et al. (2004) compared the anthropometric characteristics of 12,314 individuals (11,164 males and 11,150 females) in China, Japan, Korea, and Taiwan. Kothiyal and Tettey (2000) made anthropometric measurements on 171 people in Australia. Current anthropometric studies in Australia are generally on athletes, as in Dimitric et al. (2022), Scantlebury et al. (2022), Woodhouse et al. (2022), Thuany et al. (2023) and Hammami et al. (2023). Anthropometric studies in the five countries are not limited to these but were excluded from the scope of the study because other academic studies are generally conducted on people under the age of eighteen and the people who will be cabin crew members are adults.

3.3. Measurement Parameters

Figure 3 explains the data on height and reaching distance evaluated within the scope of the study are as follows:

- Height: It is the vertical distance of the standing person from the ground surface to the top of the head. The center of gravity of the body is in the middle so that the heels of the measured person touch each other. Shoulders and muscles are relaxed. Breathing is exhaled during the measurement.
- Reach Distance: It is measured by lifting the shoulder, right arm, and right hand straight to the top of the head at ninety degrees to the floor. Reach distance is calculated by subtracting the length of

the middle finger of the right hand. It is measured not with the fingertip of the person being measured, but the distance reached when the person folds his/her fingers.
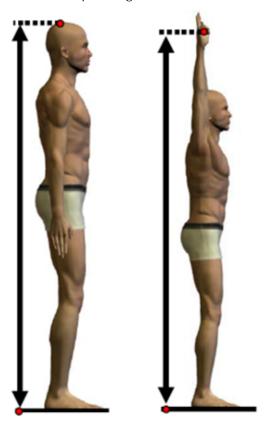

Figure 3. Height and Reach Distance Measurement Parameters

In addition to these data, hip width was analyzed by taking into account the aisle width of the A380 aircraft model. The hip measurement is determined as the horizontal distance between the right and left widest point of the runner when the heels of the measured person are together and upright.

4. Results

Within the scope of the study, statistical calculations of the height and reaching distance of men and women were made. In addition, statistical calculations of hip width were also examined by considering the aisle width of the A380 aircraft model.

4.1. Height

In height calculations in Table 3, the shortest height for women was 140.9 while the longest height was 182.9 cm. The average height was determined as 162.85 cm. The Coefficient of Variation value is 3.9% while the Standard Error is 0.14 cm. For men, the shortest height was 149.1 and the longest height was 199.3 cm. The average height was 177.62 cm. The Standard Error is 0.11 cm, and the Coefficient of Variation is 3.9%.

Table 3. Height Calculations

Variables	Females	Males
Mean	162,85	175,62
Std Error (Mean)	0,14	0,11
Std Deviation	6,42	6,86
Std Error (Std Dev)	0,1	0,08
Minimum	140,9	149,1
Maximum	182,9	199,3
Skewness	0,09	0,11
Kurtosis	3,01	3,07
Coefficient of Variation	3,90%	3,90%

Table 4. Height Ranges

Percentiles	Females (cm)	Males (cm)
1ST	148.00	160.00
2ND	149.80	162.10
3RD	150.90	163.40
5TH	152.50	164.80
10TH	154.70	166.90
15TH	156.30	168.50
20TH	157.50	169.90
25TH	158.60	171.00
30TH	159.50	172.00
35TH	160.30	172.90
40TH	161.10	173.80
45TH	161.70	174.50
50TH	162.60	175.50
55TH	163.40	176.40
60TH	164.30	177.30
65TH	165.30	178.20
70TH	166.10	179.10
75TH	167.20	180.20
80TH	168.10	181.30
85TH	169.60	182.70
90TH	171.30	184.40
95TH	174.00	187.00
97TH	175.20	189.00
98TH	176.60	190.50
99TH	178.10	192.70

4.2. Reach Distance

In the reach distance calculations in Table 5, the shortest distance for women was 165.0 while the longest distance was 230.4 cm. The average reach distance was determined as 196.76 cm. Standard Error was 0.22 cm and Coefficient of Variation value was 5%. For men, the shortest distance was 174.7 while the longest distance was 252.7 cm. The average reach distance was determined as 214.06 cm. Standard Error was 0.16 cm and Coefficient of Variation was 4.9%.

Table 5. Reach Distance Calculations

Variables	Females	Males
Mean	196,76	214,06
Std Error (Mean)	0,22	0,16
Std Deviation	9,82	10,44
Std Error (Std Dev)	0,16	0,12
Minimum	165,0	174,7
Maximum	230,4	252,7
Skewness	0,1	0,11
Kurtosis	2,96	3,06
Coefficient of Variation	5,00%	4,90%

For men, the shortest distance was 174.7 while the longest distance was 252.7 cm. The average reaching distance was determined as 214.06 cm. The reaching distance ranges of men and women were statistically calculated by calculating how many people out of every one hundred people are under which reaching distance. With this calculation, it will be easily seen how many people are under the 208 cm reaching distance, which is determined as the cabin crew selection criterion. As can be seen in Figure 5, which was created with the help of the data in Table 6, approximately 87% of women and 29% of men are below 208 cm reaching distance.

Table 6: Reach Distance Ranges

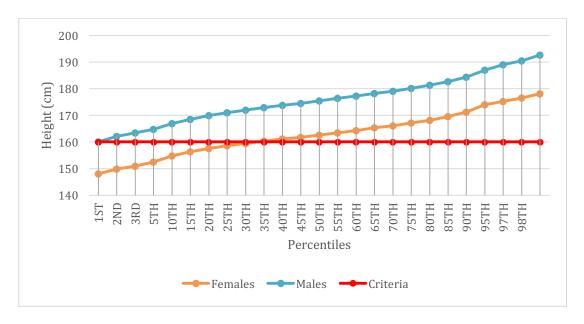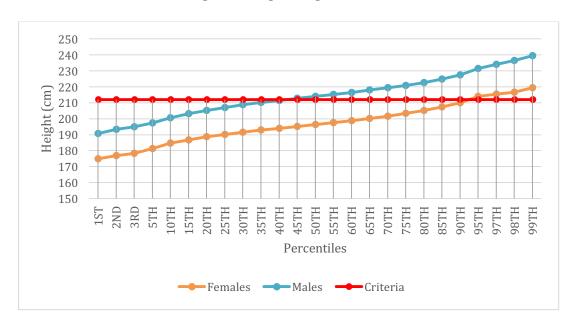| Percentiles	Females	Males
1ST	174.90	190.70
2ND	176.90	193.40
3RD	178.30	194.90
5TH	181.20	197.30
10TH	184.60	200.60
15TH	186.70	203.20
20TH	188.60	205.20
25TH	190.20	207.00
30TH	191.60	208.70
35TH	192.90	210.10
40TH	193.90	211.40
45TH	195.20	212.70
50TH	196.40	213.90
55TH	197.50	215.20
60TH	198.70	216.40
65TH	200.10	217.90
70TH	201.50	219.40
75TH	203.30	220.80
80TH	205.10	222.60
85TH	207.40	224.90
90TH	210.00	227.40
95TH	213.90	231.40
97TH	215.30	234.10
98TH	216.50	236.40
99TH	219.30	239.40

Figure 4. Height Range Statistics

Figure 5: Reach Distance Statistics

4.3. Hip Width

In hip width calculations in Table 7, the narrowest distance for women was 27.6 while the widest distance was 47.3 cm. The average hip width was determined as 35.38 cm. The Coefficient of Variation value is 7.5% while the Standard Error is 0.06 cm. For men, the narrowest distance was 26.4 while the widest distance was 45.2 cm. The average hip width was determined as 34.57 cm. Standard Error is 0.04 cm and Coefficient of Variation is 7%.

Table 7: Reach Distance Calculations

Variables	Females	Males
Mean	35,38	34,57
Std Error (Mean)	0,06	0,04
Std Deviation	2,67	2,42
Std Error (Std Dev)	0,04	0,03
Minimum	27,6	26,4
Maximum	47,3	45,2
Skewness	0,32	0,37
Kurtosis	3,53	3,47
Coefficient of Variation	7,50%	7,00%

In hip width calculations, the narrowest distance for women was 27.6 while the widest distance was 47.3 cm. The average hip width was 35.38 cm. As can be seen from the data in Table 8, 100% of women and men have a hip width narrower than the corridor width of 51 cm.

Table 8: Hip Width Ranges

Percentiles	Females	Males
1ST	29,3	29,5
2ND	30,1	30
3RD	30,6	30,3
5TH	31,1	30,8
10TH	32	31,6
15TH	32,7	32,1
20TH	33,2	32,6
25TH	33,6	32,9
30TH	34	33,3
35TH	34,3	33,6
40TH	34,6	33,9
45TH	35	34,2
50TH	35,3	34,4
55TH	35,6	34,7
60TH	36	35,1
65TH	36,3	35,3
70TH	36,6	35,7
75TH	37	36,1
80TH	37,4	36,5
85TH	38	37
90TH	38,7	37,7
95TH	40	38,7
97TH	40,8	39,6
98TH	41,3	40,1
99TH	42,3	40,9

5. Conclusion

Airlines use various selection criteria to identify suitable candidates for cabin crew. One of these criteria is the physical characteristics of the candidates, such as their height and how far they can spread their arms. This selection criterion is designed to ensure that cabin crews can easily access necessary equipment in emergency situations, access baggage lockers and assist disabled or injured passengers. The purpose of this study is to anthropometrically examine the height and reach requirements for cabin crews according to the A380 aircraft model.

In the research, it was determined that the world's five largest airlines use criteria with different anthropometric characteristics in the selection of cabin crew for A380 aircraft. Emirates and Qatar Airways preferred candidates with the shortest height but the greatest reach, while Singapore Airlines and Qantas Airways used reach as an anthropometric criterion. All Nippon Airways set a lower criterion for reach, despite having the highest height. The shortest height for women is 140.9 cm, while the longest is 182.9 cm, and the shortest height for men is 149.1 cm, while the longest is 199.3 cm. The shortest reach for women is 165.0 cm, while the longest reach is 230.4 cm, and the shortest reach for men is 174.7 cm, while the longest reach is 252.7 cm. The narrowest hip width for women is 27.6 cm while the widest hip width is 47.3 cm, and the narrowest hip width for men is 29.4 cm while the widest hip width is 48.8 cm.

As a result of the analysis, anthropometric suitability of cabin attendants was determined according to many in-flight parameters. However, it was observed that the parameters determined by airline companies for female cabin crew were not appropriate. In addition, it was determined that the standards used in cabin crew selection or aircraft design differ.

As a result of the research, it is recommended that airline companies use anthropometric measurement parameters in the selection of cabin crew. In addition, the parameters used in aircraft design or cabin crew selection should be standardized. In this way, cabin attendants can effectively fulfill tasks such as mastering emergency equipment, accessing cabin lockers, and assisting disabled or injured passengers during the flight.

In future research, legislation can be proposed for airline companies to make the use of anthropometric measurement parameters developed to meet the physical requirements of cabin crew more widespread. This research can examine the challenges airlines face when implementing anthropometric measurement parameters, the cost of implementing the parameters and the effects of the implementation. In addition, more research can be conducted on the use of anthropometric measurement parameters in aircraft design. Thus, it can be revealed how anthropometric measurement parameters can be used to determine standard dimensions for aircraft cabins and what should be done to ensure that people with different anthropometric characteristics can travel comfortably in the cabin.

Conflict of Interest

No conflicts of interest have been declared by the authors.

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