Research Article (Araştırma Makalesi)

Examination of Hearing and Blood Pressure in Call Center Operators

Çağrı Merkezi Operatörlerinde İşitme ve Kan Basıncının İncelenmesi

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Özet

Amaç: Gürültünün tanımı yapılırken öznellik çerçevesinde hoşa gitmeyen, istenmeyen, rahatsız edici ses olarak bahsedilmektedir. Fizyolojik olarak mevcut ses bireyler arası, bireyin sosyal ilişkisi veya bireyin kendi içerisindeki homeostasiyi bozuyorsa o ses artık gürültü olarak tanımlanmaktadır. Çağrı merkezi operatörleri 67-87 dB şiddet aralığında gürültüye maruz kalmaktadır. 80 dB ve üstü şiddette gürültüye maruz kalmak işitme kaybına, sistolik ve diyastolik kan basıncında artışa, kalp atış hızında değişikliğe neden olabilmektedir. Çalışmamızın amacı, çağrı merkezi operatörlerinin kulaklıkla konuşma ile mesleki gürültünün işitme, kan basıncı ve kalp atış hızıyla ilişkisini incelemektir.

Gereç ve Yöntemler: Çalışmada tüm katılımcılara elektronik sfigmomanometre ile sistolik kan basıncı, diyastolik kan basıncı ve kalp atışı ölçümü, odyometri ile işitme eşiklerinin ölçümü yapılmıştır. Çalışmaya 32'si kadın 28'i erkek 60 çağrı merkezi operatörü ve gürültülü ortamda çalışmayan 31'i kadın ve 29'u erkek 60 birey dahil edilmiştir.

Bulgular: Çalışmamızda 1000, 2000, 4000 Hz işitme eşikleri, sistolik kan basıncı, diyastolik kan basıncı ve kalp atışı gruplara göre istatistiksel açıdan anlamlı farklılık göstermektedir (p<0,05). Çağrı merkezi operatörlerinin işitme eşikleri 1000, 2000, 4000 ve 8000 Hz'te kontrol grubuna kıyasla bilateral daha yüksek bulunmuştur. Gruplar karşılaştırıldığında sistolik kan basıncı ve diyastolik kan basıncı operatör grubunda bulunan bireylerde daha yüksekken kalp atış hızı ise kontrol grubunda bulunan bireylerde daha yüksek görülmüştür.

Sonuç: Çalışmamızın sonucunda çağrı merkezi operatörlerinde kontrol grubuna kıyasla 1000 Hz ve üstü frekanslarda işitme eşikleri daha yüksek, sistolik ve diyastolik kan basıncı daha yüksek, kalp atış hızı daha düşük gözlenmiştir.

Anahtar Kelimeler: Çağrı merkezi, Kan basıncı, İşitme, Gürültü, Gürültüye bağlı işitme kaybı

Abstract

Objective: This study sought to investigate the relationship between occupational noise exposure and hearing, blood pressure, and heart rate during headset use in call center operators.

Material and Methods: An electronic sphygmomanometer was used to evaluate the heart rates, diastolic blood pressure, and systolic blood pressure of 60 participants working as call center operators and 60 participants with a noiseless working environment; Audiometry was additionally employed to measure the participants' hearing thresholds.

Results: Statistically significant differences were detected between the groups in terms of 1000, 2000, and 4000 Hz hearing thresholds, systolic blood pressure, diastolic blood pressure, and heart rate (p<0.05). In comparison to the control group, call center operators were found to have higher bilateral hearing thresholds at 1000, 2000, 4000, and 8000 Hz. Heart rate was higher in the control group, while both the diastolic and systolic blood pressures were higher in the operator group.

Conclusion: As a result of our study, it was found that hearing thresholds at frequencies above 1000 Hz were higher, systolic and diastolic blood pressure were elevated, while heart rate was lower in call center operators compared to the control group.

Keywords: Call Center, Blood Pressure, Hearing, Noise, Noise-Induced Hearing Loss.

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Submission Date: 30.09.2024

Acceptance Date: 27.05.2025

DOI: 10.17517/ksutfd.1558313

INTRODUCTION

When noise is defined, it is considered as an unpleasant, undesirable, or disturbing sound within the framework of subjectivity. Physiologically, if the presence of a particular sound disturbs the relationship between individuals, the relationship of the individuals with their surroundings, or the individual's own homeostasis, that sound is now classified as noise.

Noise can impair both sensory and cognitive auditory functions, leading to physiological and psychological harm in individuals. Furthermore, it can diminish occupational efficiency and motivation, and disturb environmental tranquility, and affect community relations. The proliferation of professions and institutions in today's industrialized world has elevated the demand for call center operators, who facilitate communication between individuals and organizations. Prolonged exposure of call center operators to headset noise may have detrimental effects on both the physical and mental well-being of these workers, akin to other occupations subjected to excessive noise levels. Increased noise intensity exacerbates the magnitude of discomfort and may further impair health. Tomei and his colleagues (2009) examined the non-auditory effects of noise at different intensity levels and observed that noise between 66-85 dB causes physiological effects such as fatigue, sudden reflexes, and neurovegetative effects such as accelerated respiration, increased blood pressure, and heartbeat, along with hearing loss (1). In studies examining the noise exposure experienced by call center operators, Patel and Broughton documented an average noise level ranging from 67 to 84 dBA over an 8-hour shift, whereas Pawlaczyk-Łuszczyńska and colleagues reported levels ranging from 66 to 86 dBA (2,3).

In the literature review conducted in consideration of this information, it was noted that no studies address the concurrent evaluation of blood pressure and hearing among call center operators.

The objective of our study was to examine the association between occupational noise exposure and its impact on hearing, blood pressure, and heart rate among call center operators while utilizing headsets.

MATERIALS AND METHODS

This study was approved by the Cappadocia University Ethics Committee Clinical Research Ethics Committee (Decision No: E-64577500-050.99-62941).

The study comprised 60 call center operators aged between 18 and 45, consisting of 32 women and 28 men, alongside 60 individuals who were not exposed to noisy environments, comprising 31 women and 29 men. A signed "Participant Informed Consent Form" was obtained from all individuals participating in the study.

The participants underwent tympanometry testing using the Interacoustics AT235 immittance device with a 226 Hz probe tone and a pressure range of (+200,-400) daPa, as well as pure tone speech audiometry tests conducted with the Interacoustic AC-33 audiometer device. Pure-tone air conduction hearing thresholds were assessed at frequencies of 125, 250, 500, 1,000, 2,000, 4,000, and 8000 Hz. Pure-tone averages were derived by computing the arithmetic mean of the hearing thresholds measured at 500, 1,000, 2,000, and 4,000 Hz.

Systolic and diastolic blood pressure, as well as heart rate was assessed using the Life Net Medikal Wbp108 sphygmomanometer on the upper arm following a five-minute rest period.

The data collected from the research were transferred to a computerized environment and analyzed using the SPSS 29.0 software package. In the data analysis, the Independent Samples T-test was employed for comparisons between two independent groups when the assumption of normal distribution was satisfied, whereas the Mann-Whitney U Test was employed in cases where this assumption was not met. To observe the link between two numerical variables, the "Pearson Correlation Test" was employed. The accepted threshold for statistical significance in all tests was $p<0.05$.

RESULTS

In the operator group, 53.3% of individuals were female, while in the control group, the proportion was 51.7%. The gender distribution across the groups did not exhibit a statistically significant difference, indicating homogeneity in gender distribution within the groups ($p>0.05$). Concerning the complaint of hearing loss, 93.3% of individuals in the operator group reported experiencing hearing loss, while none of the individuals in the control group reported such complaints. The complaint of hearing loss exhibited a statistically significant difference between the groups ($p<0.05$). Similarly, while the complaint of tinnitus did not demonstrate a significant difference between the groups ($p>0.05$), complaints of fullness in the ear and difficulty comprehending speech exhibited significant differences between the groups ($p<0.05$). The proportion of individuals who did not complain of stuffiness in the ear was 76.7% in the operator group and 90% in the control group. The complaint of "difficulty comprehending speech" was not observed in 85% of the individuals in the operator group and 96.7% of the individuals in the control group **(Tables 1, 2)**.

Table 1. Demographic Characteristics of the Participants

			Group				
			Operator	Control	Total	χ^2	P
Gender	Female	n	32	31	63	0.033	0.855
		%	53.3%	51.7%	52.5%		
	Male	n	28	29	57		
		%	46.7%	48.3%	47.5%		
Complaint of hearing loss	Yes	n	4	0	4	4.138	0.042
		%	6.7%	0.0%	3.3%		
	No	n	56	60	116		
		%	93.3%	100.0%	96.7%		
Tinnitus complaint	Yes	n	16	8	24	3.333	0.068
		%	26.7%	13.3%	20.0%		
	No	n	44	52	96		
		%	73.3%	86.7%	80.0%		
Complaint of fullness in the ear	Yes	n	14	6	20	3.840	0.050
		%	23.3%	10.0%	16.7%		
	No	n	46	54	100		
		%	76.7%	90.0%	83.3%		
Difficulty comprehending speech	Yes	n	9	2	11	4.904	0.027
		%	15.0%	3.3%	9.2%		
	No	n	51	58	109		
		%	85.0%	96.7%	90.8%		
						T	P
Age	Mean±SD		30.17±6.71	30.33±6.72		-0.136	0.892
	Median (Min-Max)		29 (22-45)	29 (20-45)			
Year of Operation	Mean±SD		6.12±6.63	-		-	-
	Median (Min-Max)		4 (1-28)	-			
Weekly working hours	Mean±SD		45.75±8.30	-		-	-
	Median (Min Max)		40 (36-72)	-			
Daily phone or headset conversation duration	Mean±SD		7.62±0.90	2.37±1,15		27.815	<0.001
	Median (Min-Max)		7 (7-10)	2 (1-5)			

*χ^2= Chi-Square Test; t=Independent Sample T Test; p<0.05

The mean ages of both groups did not exhibit a statistically significant difference, indicating homogeneous distribution of ages (p>0.05). The daily phone or headset conversation duration differs statistically significantly depending on the groups. Individuals in the operator group were more likely to have a longer daily phone or headset conversation duration (7.62±0.90) compared to individuals in the control group (2.37±1.15).

The pure-tone air conduction thresholds at 125 Hz, 250 Hz, and 500 Hz did not exhibit a statistically significant difference between the groups (p>0.05). The 1000 Hz right, 2000 Hz right and left, 4000 Hz right and left, and 8000 Hz right and left air conduction thresholds displayed a statistically significant difference between the groups (p<0.05). Upon examining the air conduction thresholds at 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz for both right and left ears, it was observed that the values for individuals in the operator group were higher compared to those in the control group.

The bone conduction hearing thresholds at 500 Hz for both right and left ears did not exhibit a statistically significant difference between the groups (p>0.05). The

Table 2. Variations in the Hearing Thresholds for Bone and Air Conduction Between Groups					
		Operator	**Control**		
		Mean±SD	**Mean±SD**	**t*/U****	**P**
125 Hz Air Conduction Threshold	Right	8.67±3.17	8.92±3.20	-0.430	0.668
	Left	8.83±3.24	8.25±3.03	1.019	0.310
250 Hz Air Conduction Threshold	Right	8.92±4.02	9.08±3.62	-0.458**	0.647
	Left	9.08±3.38	8.42±3.12	1.122	0.264
500 Hz Air Conduction Threshold	Right	10.67±4.46	11.25±4.08	-0.748	0.456
	Left	10.83±4.43	11.08±4.33	-0.313	0.755
1000 Hz Air Conduction Threshold	Right	16.08±5.22	12.25±5.71	3.841	**<0.001**
	Left	14.50±4.67	11.75±5.27	3.025	0.003
2000 Hz Air Conduction Threshold	Right	24.08±6.28	12.33±5.08	11.270	**<0.001**
	Left	23.92±5.68	12.42±4.83	70.579**	**<0.001**
4000 Hz Air Conduction Threshold	Right	39.33±7.84	13.17±5.89	20.673	**<0.001**
	Left	39.83±7.13	12.83±6.13	22.242	**<0.001**
8000 Hz Air Conduction Threshold	Right	40.50±8.96	13.75±7.17	18.060	**<0.001**
	Left	40.67±9.68	13.83±7.15	17.274	**<0.001**
500 Hz Bone Conduction Threshold	Right	9.42±4.33	9.42±3.69	0.000	1.000
	Left	9.75±4.36	9.50±3.76	0.336	0.737
1000 Hz Bone Conduction Threshold	Right	14.25±4.49	10.75±5.43	3.845	**<0.001**
	Left	14.08±4.65	10.58±5.30	3.848	**<0.001**
2000 Hz Bone Conduction Threshold	Right	22.75±5.56	11.08±4.97	74.298**	**<0.001**
	Left	22.92±5.62	10.92±4.46	77.472**	**<0.001**
4000 Hz Bone Conduction Threshold	Right	38.67±7.80	12.42±5.93	20.745	**<0.001**
	Left	39.00±7.30	11.58±5.71	22.922	**<0.001**

bone conduction hearing thresholds at 1000 Hz, 2000 Hz, and 4000 Hz for both right and left ears exhibited a statistically significant difference between the groups ($p<0.05$). Upon examination of the bone conduction hearing thresholds at 1000 Hz, 2000 Hz, and 4000 Hz for both right and left ears, it was observed that the values for individuals in the operator group were higher compared to those in the control group.

Blood pressure and heart rate values exhibited a statistically significant difference between the groups ($p<.05$). Systolic blood pressure and diastolic blood pressure values were found to be higher in individuals in the operator group. Heart rate values were higher in individuals in the control group **(Table 3)**.

Table 3. Comparison of Blood Pressure and Heart Rate Values Among Groups					
		Mean±SD	**Median (Min-Max)**	**t**	**P**
Systolic Blood Pressure	Operator	130.00±9.34	130 (102-146)	6.227	**<0.001**
	Control	116.58±13.67	116.5 (86-154)		
Diastolic Blood Pressure	Operator	83.93±8.01	85 (57-101)	5.035	**<0.001**
	Control	75.12±10.95	74 (59-107)		
Heart Rate	Operator	82.57±11,54	81.5 (58-115)	-2.327	**0.022**
	Control	87.97±13.78	87.5 (62-135)		

*t=Independent Samples t Test

DISCUSSION

Occupational noise-induced hearing loss develops over time due to years of exposure to continuous or intermittent noise. Continuous noise is more damaging than intermittent noise because it does not allow auditory structures to rest (4,5).

In the study conducted to identify modifiable and non-modifiable risk factors for noise exposure, the modifiable risk factors were identified as follows: voluntary exposure to noise, neglect of ear protection, smoking, lack of exercise, tooth loss, poor diet, cardiovascular disease, and diabetes. Non-modifiable risk factors included age, race, genetic predisposition, and gender (6,7).

Occupational noise-induced hearing loss typically manifests as symmetrical and bilateral. It is primarily characterized by notch formation, especially at 4000 Hz, and a decrease in thresholds at adjacent frequencies (3000 and 6000 Hz), with a slight improvement at 8000 Hz.

Call center operators are required to consistently utilize headphones within the work environment as an integral aspect of their job responsibilities. In environments characterized by background noise and inadequate sound isolation, operators may elevate the headphone volume output level to facilitate speech comprehension. The intensity level of background noise may not be severe enough to directly cause hearing loss; however, the continuous use of high-intensity sound coupled with manual increases in sound output can lead to hearing loss over time (8).

Patel and Broughton assessed the daily noise exposure of 150 call center operators employed in the banking, online ordering, and telecommunications sectors, utilizing a dosimeter affixed to a mannequin wearing headphones. The noises to which call center operators are exposed were determined to include call sound, fax sound, routing sound, and hold music sound. The intensity of the conversation sound was measured in the range of 72-82 dBA. The maximum noise level was recorded at 83 dBA for fax audio, 95 dBA for routing audio, and 88 dBA for music-on-hold audio. The average noise level ranged from 67 to 84 dBA, while the maximum noise level ranged from 67 to 87 dBA. Out of 150 operators, 3 were found to be exposed to noise levels exceeding 85 dBA (2).

Pawlaczyk-Łuszczyńska and colleagues researched the noise intensity levels and hearing thresholds of call center operators. The headset noise exposure level of call center operators was measured using an artificial ear, revealing that operators were exposed to noise levels ranging from 66 to 86 dB for 8 hours a day. Approximately 12% of operators were measured to be exposed to average noise levels exceeding 85 dB, while 38% were exposed to levels exceeding 80 dB. While 50% of the operators exhibited bilateral normal hearing in the frequency range of 250-8000 Hz, 73% experienced hearing loss in the extended high frequencies range of 9000-16000 Hz. Less than 10% of the operators exhibited hearing loss at both high frequencies and speech frequencies, while 37% experienced a permanent threshold shift at high frequencies (3,9).

The average noise intensity to which call center operators were exposed during working hours was measured in the range of 67-87 dB according to Patel and Broughton's study, and in the range of 66-86 dB according to Pawlaczyk-Łuszczyńska and colleagues' study. According to a study by Tomei and colleagues, noise levels exceeding 66 dB are associated with hearing loss. Based on this, it can be inferred that call center operators are subjected to noise levels that have the potential to induce hearing loss, as well as elevate blood pressure, heart rate, and respiratory rate.

Martin and colleagues investigated the impact of noise levels ranging from 85 to 90 dB on hearing thresholds. The prevalence of hearing loss was higher among workers than among controls in all age groups. Among foundry workers aged over 50, the prevalence of hearing loss ranged from 14% to 32%, compared to 4% in a control group of the same age range. Workers over 50 years of age exhibited hearing thresholds below 30 dB at 500, 1000, and 2000 Hz, with hearing loss exceeding 50 dB at 3000, 4000, and 6000 Hz (10).

In our study, similar to the investigation by Martin and colleagues, a statistically significant difference was observed between the operator and control groups in hearing thresholds at 1000, 2000, 4000, and 8000 Hz. In our study, the disparity in hearing thresholds between the groups at 4000 and 6000 Hz was greater than the difference at 1000 and 2000 Hz, similar to the findings reported by Martin and colleagues ($p<0.05$).

When speech frequencies were taken into account in our investigation, the control group members' 500, 1000, 2000, and 4000 Hz air and bone conduction hearing thresholds were found to be within the normal range. Hearing thresholds at 500 Hz air and bone conduction do not differ between the groups. It was observed that the operator group had significantly greater air and bone conduction hearing thresholds at 1000, 2000, and 4000 Hz in comparison to the control group ($p<0.05$). In call center operators, airway and bone conduction hearing thresholds at frequencies of 1000, 2000, and 4000 Hz closely align with a difference of less than 5 dB, suggesting sensorineural type hearing loss at these frequencies (11,12).

In our study, the right ear's air conduction Sound Sensitivity Observation (SSO) was obtained as 22.54±4.77, Speech Reception Threshold (SRT) was 21.27±4.49, and Speech Discrimination Score (SDS) was 98.87±2.09. Meanwhile, in the left ear, the air conduction SSO was 22.27±4.28, SRT was 21.44 ±4.28, and SDS was 98.87±2.09 in the operator group. In the control group, the right ear's air conduction SSO was 12.42±4.28; SRT was 16.33±5.51, and SDS was 100.00 ± 0.00. Similarly, in the left ear, the air conduction SSO was 12.25±4.00; SRT was 16.25±5.34, and SDS was 100.00±0.00. In the control group, the right ear's air conduction SSO was 12.42±4.28; SRT was 16.33±5.51, and SDS was 100.00±0.00. Similarly, in the left ear, the air conduction SSO was 12.25±4.00; SRT was 16.25±5.34, and SDS was 100.00 ± 0.00. The decrease in speech discrimination scores in the operator group compared to the control group supports the finding of sensorineural hearing loss in this group.

Somma and colleagues examined the hearing thresholds of cement workers in 2008 while they worked in noisy surroundings with levels exceeding 85 dB. The study included 184 male cement workers and 98 control individuals working in a quiet setting. Participants were divided into groups depending on their age. A pure tone audiometry test was applied in the range of 125-8000 Hz. In all groups, the hearing thresholds of cement workers at frequencies of 3-8 kHz were found to be significantly higher than those of the control group. For the youngest age group (21–30 years old), there was a 5 dB difference between the worker and control groups' hearing thresholds between 3–8 kHz; for the oldest age group (51–60 years old), there was a 2 dB difference. Between 3-8 kHz, a 5 dB difference was observed between the hearing thresholds of the worker and control groups in the youngest age group, aged 21-30 years, and a 2 dB difference was observed between the hearing thresholds of the worker and control groups in the oldest age group, aged 51-60 years. In both groups, hearing loss increases significantly with age, but this rise was observed more prominently in cement workers (13,14).

Our research reveals that the contact center operators' and the control groups' hearing thresholds rise noticeably with age ($p<0.05$). Nonetheless, compared to the control group, operators' hearing thresholds rise more with age. This demonstrates that older operators who are exposed to industrial noise lose their hearing. As demonstrated by Somma and colleagues' study, occupational noise accelerates the aging-related loss of hearing in call center workers.

In our study, a positive relationship was observed between the years of working in the call center and the hearing thresholds of call center operators ($p<0.05$). Hearing loss rises with the number of working years. Nevertheless, no significant correlation was found when examining the association between operators' hearing thresholds and their weekly working hours. This suggests that our study's findings about the long-term effects of call center employment on hearing (15).

It is known that the physiology of hearing differs in men and women. Wang and colleagues examined the effect of gender on noise-induced hearing loss and applied an audiometry test to 1140 female and 1140 male shipyard workers between the ages of 18-60. At frequencies of 3, 4, 6, and 8 kHz, the prevalence of hearing loss was 13.8% in women and 34.4% in men as well. A significant difference was observed at low frequencies (8).

The operator group in our study consisted of 32 female and 28 male individuals, while the control group consisted of 31 female and 29 male individuals. Similar to Wang and colleagues' study, our analysis of the influence of gender on hearing revealed that men's hearing thresholds were greater than women's in both the operator and control groups. However, this increase exhibited a significant difference between genders only in the 1000 Hz hearing thresholds among the operator group and the 125 Hz hearing thresholds within the control group ($p<0.05$).

Tekin and colleagues conducted a study to examine the effects of noise exposure on the cardiovascular system of mine workers. In this study, the systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), oxygen saturation rate, rhythm rate, and pulse values of 100 male workers were examined. Workers were measured three times using a COMEN Star 8000 bedside monitor. The first measurement was taken before the introduction of noise, the second measurement was taken after all the machines were turned on and the noise was present, and the third measurement was taken after all the machines were turned off and the noise was eliminated. The increase in SBP and DBP values in the second measurement compared to the third measurement is statistically significant. No significant difference was observed in blood pressure, oxygen saturation rate, rhythm rate, and pulse values (17).

In our study, the average SBP in the operator group was 130.00±9.34, while the DBP was 83.93±8.01, and the HR was 82.57±11.54. In contrast, the average SBP in the control group was 116.58±13.67, the DBP was 75.12±10.95, and the HR was 87.97±13.78. There is a significant difference between SBP, DBP, and HR groups ($p<0.05$). When comparing the SBP, DBP, and HR values between the groups, the HR value was higher in the control group, while the SBP and DBP values were higher in the operator group, consistent with the findings of Tekin and colleagues.

Abbate and colleagues looked into how exposure to noise affects the cardiovascular system. In the study, 757 male employees of oil distribution and refining companies were split into three groups based on the amount of noise participants were exposed to: low, medium, and high. Their SBP, DBP, and HR values were also looked at. The study included 200 workers who were classified as low exposure (noise level less than 80 dBA), 212 drivers who were classified as medium exposure (noise level between 80 and 85 dBA), and 345 workers who were classified as high exposure (noise level between 85 and 90 dBA). Although there was a statistically significant positive correlation between the groups' noise exposure levels and SBP and DBP values, there was no such correlation with the HR value. Simultaneously, SBP, DBP, and HR values increase linearly with the age and working years of employees (18,19).

In our study, similar to the findings of Abbate et al., a significant positive relationship was observed between age and SBP and DBP values in the operator group, but no relationship was observed with HR ($p<0.05$). As age increases, systolic and diastolic blood pressure increases in operators. In the control group, there was no correlation seen between age and heart rate or blood pressure. In our study, similar to Abbate and colleague's findings, a significant positive correlation was observed between the working years of call center operators and blood pressure ($p<0.05$). By increasing working years, the SBP, DBP, and HR values of operators rise. While the effect of weekly working hours on blood pressure was not observed in call center operators, the increase in SBP, DBP, and KA values as the working years increase reveals the long-term effect of occupational noise on operators.

Wiinberg and colleagues looked into how gender variations affected blood pressure in 1995. In the study, the ambulatory blood pressure of normotensive individuals, both male and female, between the ages of 20-79, was measured for 24 hours. Participants were divided into groups based on their age. Ambulatory blood pressure was measured every 15 minutes between 07:00 and 22:59, and every 30 minutes between 23:00 and 06:59. It was determined to be statistically significant that SBP rises with age and is higher in males than in women. In the 50–59 age group, DBP values only increased with age in men and women. There was no gender difference in these values. Blood pressure values obtained at night were 15% lower than those measured during the day. As a result of the study, it was noted that SBP values were higher in men compared to women, whereas DBP values remained unaffected by gender (20).

In our study, statistically significant differences were observed in SBP values between the operator and control groups based on gender ($p<0.05$). The mean SBP among women in the operator group (127.38±8.68) was observed to be lower compared to that among men (133.00±9.31). The mean SBP among women in the control group (113.23±15.94) was observed to be lower compared to that among men (120.17±9.79). In our study, similar to the findings of Wiinberg and colleagues, the mean SDB was higher in men than in women in both the operator and control groups. There were no significant differences in DBP and HR values between individuals in the operator and control groups based on gender ($p>0.05$).

In our study, it was observed that call center operators exhibited higher hearing thresholds at frequencies of 1000 Hz and above, as well as higher SDB and DBP values, and lower HR values compared to the control group.

A significant positive correlation was observed between age and hearing thresholds in both operator and control groups. The increase in hearing thresholds with advancing age was more pronounced in the operator group compared to the control group.

In call center operators, a significant positive correlation was found between age and SBP and DBP, while no correlation was observed with HR. As age increases, there is a concurrent increase in both SBP and DBP values within the operator group. In the control group, no significant relationships were observed between age and SBP, DBP, and HR values.

It was observed a significant positive relationship between the duration of employment in the call center and both blood pressure levels and hearing thresholds among operators. The hearing thresholds, SBP, DBP, and HR values of call center operators were observed to increase with prolonged years of employment.

A significant difference was observed in the average SBP between genders in both the operator and control groups. In the operator group, it was observed that SBP values were higher in men compared to women.

Ethics Committee Approval: This study was approved by the Cappadocia University Clinical Research Ethics Committee (Decision No: E-64577500-050.99-62941) on December 27, 2023.

Participant Consent: A signed "Participant Informed Consent Form" was obtained from all individuals participating in the study.

Author Contributions: Conceptualization – AB, MÖ; Design – AB, MÖ; Supervision – MÖ; Materials – AB; Data Collection and/or Processing – AB; Analysis and/or Interpretation – MÖ; Literature Review – AB; Writing – AB, MÖ; Critical Review – MÖ.

Conflict of Interest: Each of the authors has contributed to, read, and approved this manuscript. None of the authors has any conflict of interest, financial or otherwise.

This manuscript is original, and it, or any part of it, has not been previously published; nor is it under consideration for publication elsewhere.

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