

## Werk

**Titel:** Comparison between the vowels of German and Turkish

**Autor:** Coşkun , Volkan

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[Digizeitschriften e.V.](#)  
SUB Göttingen  
Platz der Göttinger Sieben 1  
37073 Göttingen

✉ [info@digizeitschriften.de](mailto:info@digizeitschriften.de)

# Comparison between the vowels of German and Turkish

**Volkan Coşkun**

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In 1999 and 2000, Prof. Dr. Jens-Peter Koester, a phonetics professor, gave me the opportunity to do some research in the laboratory of the University of Trier. During my research I was able to determine the quantities and qualities of the Turkish vowels. In a series of tests, vowels articulated by several male adult speakers who spoke Standard Turkish fluently were analyzed by means of spectrograms. To this end, the formant frequencies of German vowels were taken from the *Atlas Deutscher Sprachlaute*, written by Hans Heinrich Wängler. In the present article, the differences and similarities of the Turkish and German vowels in view of articulation, phonology and acoustics have been identified. The vowels are identified in terms of their articulatory classification, which comprises the following features: compact, diffuse, gravis, flat and long. Finally, for the phonological definition, in order to distinguish the Turkish vowels in detail, features such as back, front, high, low, round, tense and long are examined.

Within the Turkish vowel system we distinguish 19 monophthongs, ten of which are short, and nine are long. The quality of the vowel depends on its surroundings or, more precisely, on the segment that follows. The distinctive function of the quantity is so important that it affects the orthography as well.\*

*Volkan Coşkun, Muğla Üniversitesi, Eğitim Fakültesi, Kötekli, 48000 Muğla, Türkiye.*

## 1. Introduction

### 1.1.

The Turkic languages cover a large area stretching from the European part of Turkey through Central Asia to Northeast Siberia. The morphological differences between them are much smaller than the phonetic and lexical ones. The Turkish vowels dealt

\* My knowledge about the Turkish vowels is based on several experimental research studies carried out in the phonetic laboratory of the Trier University in Germany. First of all I would like to thank to Prof. Dr. Jens-Peter Koester, who gave me the opportunity to use his laboratory. My further thanks is to Dr. Herbert Masthoff, who helped me with his scientific experience. In addition my special thanks to Prof. Dr. Ethem Ruhi Figlali, the President of Mugla University, who supported me to carry out this research.

with in this article derive from the language spoken in modern Turkey today, which is based on the dialect of Istanbul, and is also called Standard Turkish.

## 1.2.

In 1999 and 2000, Dr. Jens-Peter Koester, a phonetics professor, gave me the opportunity to do some research in the phonetics laboratory at the University of Trier. During my research I was able to determine the quantities and qualities of the Turkish vowels. In the test series several male adult speakers, who spoke Standard Turkish fluently, articulated vowels as isolated. The vowels were then analyzed with the help of a spectrogram. In order to this, the formant frequencies of German vowels were taken from the *Atlas deutscher Sprachlaute*, written by Hans Heinrich Wängler. The present article identifies the differences and similarities between the Turkish and German vowels with respect to their articulation, phonology and acoustics.

## 2. The classification of the vowels

The vowels can be defined in terms of articulation, acoustics and phonology.

### 2.1. Articulatory definition

Standard Turkish possesses the following vowel qualities.

<i>i</i>	<i>y</i>		<i>u</i>
			<i>ʊ</i>
		<i>ə</i>	
<i>ɛ</i>	<i>æ</i>		<i>ɔ</i>
<i>a</i>		<i>a</i>	

The vowels are grouped according to the following articulatory classification.

#### 2.1.1. Part of the tongue

This classification deals with the horizontal movement of the tongue. The horizontal movement of the tongue affects the formation of the vowels.

	Turkish	German
front	[i], [y], [œ], [a:], [i:], [y:], [ɛ], [ɛ:], [œ:], [a]	[e:], [ø:], [ɪ], [ʏ], [i], [i:], [y:], [œ:], [ɛ], [ɛ:], [a]
central	[ə], [ə:]	[ə]
back	[u], [ɔ:], [ɑ], [u:], [ʊ], [ɔ], [ɑ:]	[o:], [u:], [ʊ], [ɔ], [ɑ:]

#### 2.1.2. Opening degree of the oral cavity

The opening degree refers to the size of the angle between the upper and the lower jaw, which forms the vertical opening of the mouth. It refers to the distance between

the surface of the whole tongue and the palate during the articulation of the vowels. High vowels are closed, low vowels are open.

	Turkish	German
closed	[i], [y], [u], [i:], [y:], [u:]	[i:], [y:], [u:]
closed-half closed	[ʊ]	[ɪ], [ʏ], [ʊ]
half closed	[ə], [ə:]	[e:], [ø:], [o:]
half closed-half open	--	[ɘ]
half open	[ɔ:], [œ:], [ɛ], [ɛ:], [œ], [ɔ]	[ɛ], [ɛ:], [ɔ], [œ]
half open-open	--	[ɐ]
open	[a:], [ɑ], [a], [ɑ:]	[a], [ɑ:]

### 2.1.3. Lip position

The lip position expresses the curving and the labializing of the vowels. The phonetic formation of rounded and spread vowels depends both on the position of the lips and the movements of the lower jaw and the tongue, two of the most important articulators. We differentiate the vowels as spoken with spread, rounded or neutral lips.

	Turkish	German
spread	[i], [ə], [ə:], [a:], [ɑ], [i:], [ɛ], [ɛ:], [a], [ɑ:]	[ɪ], [i:], [ɛ], [ɛ:], [a], [ɑ:]
neutral	--	[ə], [ɐ]
rounded	[y], [u], [ɔ:], [œ:], [y:], [u:], [ʊ], [œ], [ɔ]	[ʏ], [ø:], [o:], [y:], [u:], [ʊ], [œ], [ɔ]

### 2.1.4. Muscle tension

The muscle tension is based on the degree of the strain of the speech organs. In German and Turkish, the long vowels are tense, the short ones are lax.

	Turkish	German
tense	[ə:], [ɛ:], [œ:], [ɔ:], [a:], [ɑ:], [i:], [y:], [u:]	[e:], [ø:], [o:], [i:], [y:], [u:] [ɛ:]
half tense	--	[a], [ɑ:]
lax	[i], [y], [u], [ə], [a], [ɑ], [ʊ], [ɛ], [œ], [ɔ]	[ɪ], [ʏ], [ə], [ɐ], [ʊ], [ɛ] [œ] [ɔ]

### 2.1.5. Length

The length, which is technically easy to measure with the help of an oscillograph, is important in both Turkish and German. The short vowels in German are traditionally

referred to as “open”; the long ones as “closed”. In the articulatory vowel diagram, the length of the vowels is indicated by a colon (:).

	<i>Turkish</i>	<i>German</i>
long	[ɔ:], [œ:], [a:], [i:], [y:], [u:], [ø:], [ɛ:], [ɑ:]	[ø:], [o:], [e:], [i:], [y:], [u:], [ɛ:], [ɑ:]
short	[i], [y], [u], [ə], [ɑ], [ʊ], [ɛ], [œ], [ɔ], [a]	[ɪ], [ʏ], [ə], [ɐ], [ɛ], [œ], [ɔ], [ʊ], [a]

The following articulatory vowel diagram shows the short and long vowels of the Turkish language.

		Part of the tongue					Length
		front		central	back		
		lip position					
		spread	rounded	spread	spread	rounded	
Opening degree of the mouth space	closed	<i>i</i>	<i>y</i>			<i>u</i>	long-short
	closed-half closed					<i>ʊ</i>	short
	half closed			<i>ə</i>			long-short
	half open	<i>ɛ</i>	<i>œ</i>			<i>ɔ</i>	long-short
	half open-open						long-short
	open	<i>a</i>				<i>a</i>	long-short

Examples of the Turkish monophthongs:

1	2	3	4	5	6	7
<i>iki</i> [i'ci]	<i>iğne</i> [i:'ne]	<i>üzüm</i> [y'zym]	<i>düğme</i> [dy:'me]	<i>uzun</i> [u'zun]	<i>tuğra</i> [tu:'ra]	<i>mahlûk</i> [mah'luk]

8	9	10	11	12	13	14
<i>ılık</i> [ɐ'lək]	<i>tığ</i> [tə:]	<i>ekmek</i> [ec'mec]	<i>yeğen</i> [je:'en]	<i>öz</i> [œz]	<i>öğretmen</i> [œ:'retmen]	<i>kor</i> [kɔr]

15	16	17	18	19
<i>doğu</i> [dɔ:'u]	<i>kâr</i> [car]	<i>kâmil</i> [ca'mil]	<i>kar</i> [kar]	<i>kağrı</i> [ka:'nə]

## 2.2. The acoustic definition

The acoustic definition of vowels is based on the acoustic characteristics of the voiced source and the tail pipe configuration. The basic tone and its appendant overtones are filtered by the resonance characteristics of the throat-nose-mouth space in such a way that three formants usually develop for each individual vowel. Two of them (F1 and F2) are traditionally used for the vowel characterization. These values of the formants (F1 and F2) are placed in a two-dimensional coordinate system, and they allow the precise description of all the vowels. The frequencies of the formants of the Turkish vowels, which were determined during my research in the laboratory at the University of Trier, and the German vowels, which were measured by Hans Heinrich Wängler (1976), are represented in the following table and entered under the appropriate formant.

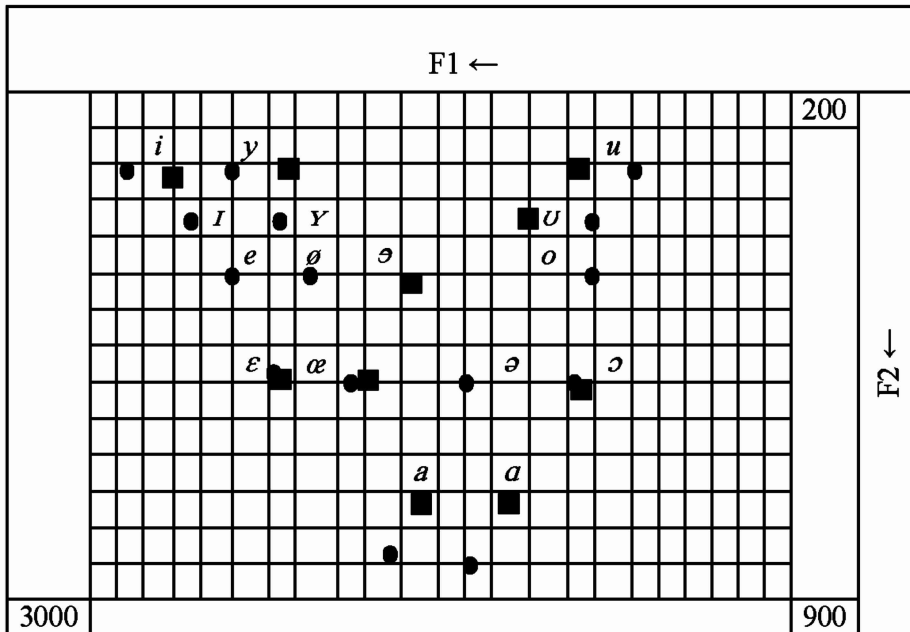
The following table contains the frequencies of the German and Turkish vowels:

German			Turkish		
	F1	F2		F1	F2
<i>a</i>	800	1400	<i>a(:)</i>	650	1250
<i>a:</i>	850	1150	<i>a(:)</i>	650	1075
<i>ε</i>	500	1900	<i>ε(:)</i>	500	1875
<i>e:</i>	375	2100			
<i>ə</i>	500	1200			
<i>ɪ</i>	325	2200			
<i>i:</i>	275	2400	<i>i(:)</i>	275	2200
<i>ɔ</i>	500	900	<i>ɔ(:)</i>	500	850
<i>o:</i>	375	850			
<i>u</i>	325	850	<i>u</i>	325	1000
<i>u:</i>	275	750	<i>u(:)</i>	275	825
<i>œ</i>	500	1550	<i>œ(:)</i>	500	1500
<i>ø:</i>	375	1800			
<i>ʏ</i>	325	1800			
<i>y:</i>	275	2000	<i>y(:)</i>	275	1800

			ə(:)	375	1375
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Diagram of the values of formants of German and Turkish vowels:

- Turkish
- German



Jakobson, Fant & Halle (1951) devised a system of acoustic features that would allow the phonetic (more often referred to as phonological) description and definition of vowels and consonants. The system of Jakobson, whose ideas go back to the founder of phonology in Prague, N. S. Trubezkoy, is an early contribution to the study of linguistics. Jakobson's system has a strictly acoustic and binary nature. It operates with discrete [+] or [-] values of the features. For the description of the Turkish vowels, the following acoustic characteristics are needed, whose number in the overall system amounts to twelve pairs of characteristics.

2.2.1.

Compact: Both formants are in the middle of the spectrum, relatively close to each other. If the sounds are compact, F1 appears quite high.

	Turkish	German
compact	[a], [a:], [ɑ], [ɑ:]	[a], [ɑ:]

**2.2.2.**

**Diffuse:** The Features are called “diffuse” if the formants are far apart. The intensity is located in the periphery of the sonogram. In the case of diffuse sounds, F1 is very low.

	Turkish	German
diffuse	[i], [i:], [y], [y:], [u], [u:], [ʊ]	[i:], [ɪ], [y:], [u:], [ʏ], [ʊ]

**2.2.3.**

**Gravis:** In the sonogram, the concentration of intensity is visible on the lower periphery, i.e. in the lower frequency range. If the sounds are gravis, F1 and F2 are only slightly apart; if the sounds are high, both formants are far apart.

	Turkish	German
gravis	[u], [u:], [ʊ], [ɔ], [ɔ:]	[u:], [ʊ], [o:], [ɔ]
±gravis	[ə], [ə:]	[ə], [ɐ]

**2.2.4.**

**Flat:** This feature only refers to vowels that have a high F2. Furthermore, those vowels have to possess the same F1. If two vowels fulfill these conditions, the one with the lowest F2 is considered flat.

	Turkish	German
flat	[y], [y:], [œ], [œ:]	[y:], [ʏ], [ø:], [œ]

**2.2.5.**

**Long:** This feature possesses a phonological character and is distinctive. To be referred to as “long”, the long vowel has to be almost twice as long as the short one.

	Turkish	German
long	[ɔ:], [œ:], [a:], [i:], [y:], [u:], [ɛ:], [ɛ:], [ɑ:]	[ø:], [o:], [e:], [i:], [y:], [u:], [ɛ:], [ɑ:]

The following articulatory vowel diagram represents the acoustic features of the Turkish vowels:

	-gravis		±gravis	+gravis	
	-flat	+flat			
+diffuse	<i>i(:)</i>	<i>y(:)</i>			<i>u(:)</i>
+diffuse					<i>ʊ</i>





	German	Turkish
	Long vowels	
	Different opening degree	
/i:/#/e:/	<i>Tier – Teer</i> /ti:r/#/te:r/ (phonetic: [ti:ɐ] – [te:ɐ])	
/e:/#/ɛ:/	<i>Reeder – Räder</i> /re:d ə r/#/redər/	
/e:/#/a:/	<i>Mär – Maar</i> /mɛ:r/#/ma:r/	
/u:/#/o:/	<i>Kur – Chor</i> /ku:r/#/ko:r/	
/o:/#/a:/	<i>bot – bat</i> /bo:t/#/ba:t/	
/y:/#/ø:/	<i>Rühmer – Römer</i> /ʀy:mər/#/rø:mər/	
/ø:/#/a:/	<i>Öl – Aal</i> /ø:l/#/a:l/	
/i:/#/ɛ:/		<i>çiğ – çığ</i> /tʃi:/#/tʃɛ:/
/i:/#/e:/		<i>diğer – değer</i> /di:'ɛr/#/de:'ɛr/
/i:/#/a:/		<i>iğ – ağ</i> /i:/#/a:/
/y:/#/ɛ:/		<i>düğme – değme</i> /dy:'me/#/de:'me/
/u:/#/o:/		<i>tuğ – tuğ</i> /tu:/#/tø:/
/ø:/#/ɔ:/		<i>diğın – doğan</i> /dø:'an/#/dɔ:'an/
/ø:/#/a:/		<i>sığır – sağır</i> /sø:'ər/#/sa:'ər/
/ɔ:/#/a:/		<i>yoğ – yağ</i> /yo:/#/ya:/
	Front vowels – back vowels	
/i:/#/u:/	<i>Tier – Tour</i> /ti:r/#/tu:r/	
/e:/#/o:/	<i>reden – roden</i> /re:dən/#/ro:dən/	
	Front vowels – back rounded vowels	
/i:/#/y:/	<i>Mieder – müder</i> /mi:dər/#/my:dər/	
/e:/#/ø:/	<i>Lehne – Læhne</i> /le:nə/#/lø:nə/	
	Rounded front vowels – back vowels	
/y:/#/u:/	<i>spülen – spulen</i> /ʃpy:lən/#/ʃpu:lən/	
/ø:/#/o:/	<i>Möhren – Mohren</i> /mø:rən/#/mo:rən/	
	Short vowels	
	Different opening degree	
/ɪ/#/ɛ/	<i>Stille – Stelle</i> /ʃtɪlə/#/ʃtelə/	
/ɛ/#/a/	<i>Äcker – Acker</i> /ɛkər/#/akər/	<i>lef – lâf</i> /leɪ/#/laf/
/ʊ/#/ɔ/	<i>Glucke – Glocke</i> /gløkə/#/glɔkə/	
/ɔ/#/a/	<i>lochen – lachen</i> /lɔxən/#/laxən/	
/ʏ/#/œ/	<i>knüpfen – knöpfen</i> /knʏpfən/#/knœpfən/	
/œ/#/a/	<i>kænnte – kannte</i> /kœntə/#/kantə/	<i>kör – kâr</i> /cœr/#/car/
/ɪ/#/ə/		<i>asil – asıl</i> /a'sil/#/a'səl/
/ɪ/#/ɛ/		<i>bilgi – belge</i> /bil'ji/#/bel'je/

/i/#/œ/		<i>giz – göz</i> /fiz/#/fœz/
/i/#/a/		<i>kir – kâr</i> /cir/#/car/
/i/#/ɑ/		<i>cin – can</i> /cin/#/can/
/y/#/e/		<i>büzmek – bezmek</i> /byzmec/#/bezmec/
/y/#/œ/		<i>güç – göç</i> /fyç/#/fœç/
/y/#/ɔ/		<i>büz – boz</i> /byz/#/boz/
/y/#/a/		<i>lüp – lâp</i> /lyp/#/lap/
/y/#/ɑ/		<i>cüz – caz</i> /cyz/#/caz/
/u/#/ə/		<i>duş – dış</i> /duʃ/#/dəʃ/
/u/#/e/		<i>but – bet</i> /but/#/bet/
/u/#/œ/		<i>çul – çöl</i> /tʃul/#/tʃœl/
/u/#/ɔ/		<i>burç – borç</i> /burtʃ/#/bɔrtʃ/
/u/#/ɑ/		<i>kur – kar</i> /kur/#/kar/
/ə/#/e/		<i>atış – ateş</i> /a'tɔʃ/#/a'teʃ/
/ə/#/ɔ/		<i>kâr – karo</i> /kɑ'rə/#/kɑ'rɔ/
/ə/#/a/		<i>kir – kâr</i> /cir/#/car/
/ə/#/ɑ/		<i>adım – adam</i> /a'dəm/#/a'dam/
/e/#/a/		<i>emel – amel</i> /e'mel/#/a'mel/
/ɔ/#/ɑ/		<i>boş – baş</i> /boʃ/#/baʃ/
Front vowels – back vowels		
/ɪ/#/ʊ/	<i>Kippe – Kuppe</i> /'kɪpə/#/'kʊpə/	
/e/#/ɔ/	<i>Geld – Gold</i> /gɛld/#/gɔld/	<i>beş – boş</i> /beʃ/#/boʃ/
/i/#/u/		<i>bilme – bulma</i> /bil'me/#/bul'ma/
Front vowels – rounded front vowels		
/ɪ/#/ʏ/	<i>Kiste – Küste</i> /kɪstə/#/kʏstə/	
/i/#/y/		<i>diz – düz</i> /diz/#/dyz/
/e/#/œ/	<i>Bäckchen – Böckchen</i> /'bɛkçən/#/'bœkçən/	<i>cenk – cönk</i> /dʒɛnc/#/dʒœnc/
Rounded front vowels – back vowels		
/ʏ/#/ʊ/	<i>Müll – Mull</i> /mʏl/#/mʊl/	
/y/#/u/		<i>üç – uç</i> /ytʃ/#/utʃ/
Vowels of different quantity		
/e:/#/e/	<i>quellen – quälen</i> /'kve:lən/#/'kve:lən/	<i>eğmek – emek</i> /e:'mɛc/#/e'mɛc/
/a:/#/a/	<i>Schall – Schal</i> /ʃal/#/ʃa:l/	
/i:/#/i/		<i>iğlik – ilik</i> /i:'lic/#/i'lic/
/y:/#/y/		<i>yüğük – yürük</i> /jy:'ryc/#/jy'ryc/
/u:/#/u/		<i>şûra – şura</i> /ʃu:'ra/#/ʃu'ra/
/ə:/#/ə/		<i>sığla – sıla</i> /sə:'la/#/sə'la/

/œ:/#/œ/		öğrek – örek /œ:'rɛc/#/œ'rɛc/
/ɔ:/#/ɔ/		doğru – doru /dɔ:'ru/#/dɔ'ru/
/ɑ:/#/ɑ/		âdet – adet /ɑ:'dɛt/#/ɑ'dɛt/
Different quantity and quality		
/i:/#/ɪ/	Kiepe – Kippe /ki:pə/#/kɪpə/	
/y:/#/ʏ/	Fühler – Füller /'fy:lər/#/'fʏlər/	
/u:/#/ʊ/	spuken – spucken /'ʃpu:kən/#/'ʃpʊkən/	
/e:/#/ɛ/	Beet – Bett /be:t/#/bɛt/	
/ø:/#/œ/	Höhle – Hölle /'hø:lə/#/'hœlə/	
/o:/#/ɔ/	Ofen – offen /o:fən/#/ɔfən/	
/ɔ:/#/ɑ/		oğlan – alan /ɔ:lan/#/alan/

### Summary

The sounds [ɪ], [ʏ], [e:], [ø:], [o:], [ə] and [ɐ] do not exist in Turkish while [i], [y], [u], [ə], [ɐ:], [œ:], [ɔ:], [ɑ:] and [ɑ] are not used in German. Almost all the German vowels are formed further in front than the corresponding Turkish vowels (with the exception of [u:]). The Turkish [u(:)] is produced more in front than the corresponding German vowel. The German [a] and [ɑ:] are formed further in front and lower than the corresponding Turkish ones. In German the closed vowels are long, the open ones are short, except for the vowels in foreign words. Closed and open vowels in Turkish are both long and short (except [ʊ]). The system of monophthongs of German and Turkish reveals an obvious symmetry in the arrangement of front and back vowels. In German, vowel doubling means a larger quantity of the vowel (= lengthening), and consonant doubling means a smaller quantity of the vowel (= reduction). In German, the letters <h> and <e> are used as length-marks after an <i>. Turkish, on the other hand, only has the length-mark <ğ>.

The Turkish vowels dealt with in this article essentially possess the same qualities as the German ones.

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