

# Normative Data for the Bouba-Kiki Effect in Turkish-Speaking Adults: A Descriptive Study

## Türkçe Konuşan Erişkinlerde Bouba-Kiki Etkisinin Normatif Değerleri: Tanımlayıcı Bir Araştırma

Halil Tayyip UYSAL<sup>a</sup>, Mariam KAVAKCI<sup>a</sup>

<sup>a</sup>Department of Speech-Language Pathology, Ankara Yıldırım Beyazıt University Faculty of Health Sciences, Ankara, Türkiye

**ABSTRACT Objective:** The bouba-kiki (BK) effect is a phenomenon associated with cognitive representations in auditory-verbal processing and integration of words. The role of BK effect in language acquisition has been documented in previous work. The BK effect has been studied in many cultures and languages and has been reported with similar results. In these reports, it was seen that the listeners who were exposed to the bouba expression chose the oval from the sharp or oval shape presented, and the sharp one for the kiki expression. The aim of this study is to examine the BK effect in Turkish-speaking adults. **Material and Methods:** 214 Turkish speaking adults were included in the study. The figures were presented in a randomized manner while the BK stimulus was given. Of the stimuli, the bouba one is oval and the kiki one is sharp. The study was conducted online via Google Forms. Each participant made a total of four trials, 2 preliminary trials and 2 main trials. The application was completed in an average of five minutes. Descriptive statistics from the SPSS 23.00 package program were used. **Results:** The majority (81.7%) of the individuals participating in the study were women. 67.7% of the participants showed the BK effect in the first trial and stated that the shape representing the bouba stimulus was oval and the shape representing the kiki stimulus was sharp. Similarly, in the second trial, 64.4% of the participants confirmed the BK effect as stated in the first trial. **Conclusion:** The results of the study support the existence of the BK effect in Turkish speaking adults. Future research directions are discussed in the light of the present findings.

**Keywords:** Bouba-kiki effect; cross-modal integration; sound symbolism; sound and shape

**ÖZET Amaç:** Bouba-kiki (BK) etkisi, işitsel-sözel işlemede ve sözcüklerin entegrasyonunda bilişsel düzeydeki temsillerle ilişkili bir fenomendir. BK etkisinin dil edinim süreçlerinde, önemli bir noktada yer aldığı literatürde belirtilmektedir. BK etkisi, birçok kültür ve dilde çalışılmış ve benzer sonuçlarla raporlanmıştır. Bu raporlar, bouba ifadesine maruz kalan dinleyicilerin sunulan köşeli ya da oval şekilden oval olanı, kiki ifadesinde ise köşeli olanı seçtikleri görülmüştür. Bu çalışmanın amacı, Türkçe konuşan erişkinlerde belirtilen BK etkisinin varlığını incelemektir. **Gereç ve Yöntemler:** Çalışmaya 214 Türkçe konuşan erişkin dâhil edilmiştir. BK uyararı verilirken şekiller randomize edilerek sunulmuştur. Uyararlardan bouba olan oval şekilde, kiki olan ise köşeli şekilde yer almıştır. Çalışma çevrim içi olarak Google Formlar üzerinden yürütülmüştür. Her bir katılımcı 2 ön deneme, 2 esas deneme olmak üzere toplamda 4 yapmıştır. Uygulama ortalama 5 dk'da tamamlanmıştır. Çalışmanın sonuçlarını raporlamak için SPSS 23.00 paket programından tanımlayıcı istatistikler kullanılmıştır. **Bulgular:** Çalışmaya katılan bireylerin çoğunluğu (%81,7) kadındır. Katılımcıların %67,7'si ilk denemede BK etkisini göstermiş ve bouba uyararını temsil eden şekli oval, kiki uyararını temsil eden şekli köşeli olarak belirtmiştir. İkinci denemede de benzer şekilde katılımcıların %64,4'ü BK etkisini ilk denemede belirttiği gibi onaylamıştır. **Sonuç:** Çalışmanın sonuçları BK etkisinin Türkçe konuşan erişkinlerde varlığını desteklemektedir. Elde edilen bulgular doğrultusunda ileriki araştırmalarla ilgili öneriler tartışılmıştır.

**Anahtar Kelimeler:** Bouba-kiki etkisi; modlar arası entegrasyon; ses temsilleri; ses ve şekiller

The bouba-kiki (BK) effect is among the most well-known word-form associations.<sup>1</sup> The basis for investigating this effect is based work by Köhler.<sup>2</sup> Köhler used the labels takete for the sharp (pointy) shape and maluma for the oval shape. As expected, most subjects were able to match the sharp shape to takete and the oval shape to maluma. Experimental

results of the BK effect have been documented by many studies.<sup>1-4</sup> To explain this effect, Ramachandran and Hubbard suggest that the phonemic sounds of words are matched to the articulatory motor representations by listeners, which is then transformed into a spatial form.<sup>1</sup> The cross-linguistic effect of the BK effect has been reported by various studies.<sup>5-7</sup>

**Correspondence:** Halil Tayyip UYSAL

Department of Speech-Language Pathology, Ankara Yıldırım Beyazıt University Faculty of Health Sciences, Ankara, Türkiye

**E-mail:** htuysal@ybu.edu.tr



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The BK effect appears to require a cross-over between sensory processes (i.e. visual and auditory). From the visual stimuli presented, “bouba” corresponds to the oval shape, and “kiki” corresponds to the sharp shape. Articulation appears to be an important aspect in the auditorily presented stimuli “bouba” and “kiki”.<sup>3,4,8</sup> Ramachandran and Hubbard suggest that the BK effect may provide important clues about the origins of language.<sup>1</sup> As may be the case with the BK effect, heuristic pairings may reflect limitations in sound-object pairings.<sup>2</sup> The crossovers in question here may have been involved in modulating sounds with certain references and features. Therefore, it is possible that the BK effect played a role implied in formation of the first words used in human history.<sup>9</sup>

Studies investigating the BK effect have documented the importance of orthography. However, although it is thought that the use of the Roman alphabet gives more effective results, there are also studies that argue that orthography may not be important. One such study showed that Himba-speaking individuals and Taiwanese-speaking individuals who do not have experience with Western languages also show the BK effect when presented with stimuli different from their own language.<sup>5,10</sup>

In a meta-analysis including other international studies, it has been documented that English, French, Italian, Himba, Syuba and Hunjara speaking individuals have a high BK effect.<sup>11</sup> On the other hand, studies conducted in Nepal and Papua New Guinea reported no BK effect.<sup>12</sup> Thus, most but not all studies show the presence of a BK effect. This is presumably due to a mismatch between the particular stimulus characteristics and the sound structure of the target language.<sup>11</sup>

Ćwiek et al. reported a limited BK effect in Turkish, Albanian and Romanian languages.<sup>6</sup> The authors suggested that the sample size they included may not be sufficient and it would be appropriate to repeat the study in the future. Considering the above-mentioned literature, the current study aims to investigate the BK effect on healthy Turkish-speaking adults.

## MATERIAL AND METHODS

### ETHICAL CONSIDERATIONS

Ethics Committee of Ankara Yıldırım Beyazıt University approval of this study was obtained from (date: March 15, 2022, no: 2022/735). The present study was carried out in accordance with the Helsinki Declaration principles.

### PARTICIPANTS AND PROCEDURES

Two-hundred and fourteen adult participants (M age=25.72, standard deviation=6.08, range=16-47) were included in the study. Inclusion criteria were having Turkish as the native language, being over 18 years old, not having any known disability, and not having previously participated in a BK effect survey. Eight participants were excluded from the study due articulation problems (n=2), stuttering (n=4), and hearing impairment (n=2). Participants were recruited via social media and the study was conducted online. Information on the characteristics of the participants is given in [Table 1](#).

### VISUAL STIMULI

The BK effect examines participants’ responses to two sound-shape pairings. Figures used in this study were created by the first author of this study (H.T.U).

**TABLE 1:** Characteristics of respondents (n=214).

Characteristics	Frequency	%
<b>Gender</b>		
Female	175	81.7
Male	39	18.3
<b>Educational level</b>		
Primary school	1	0.4
Middle school	3	1.4
High school	67	31.3
Bachelor’s degree	104	48.5
Master’s degree	33	15.4
Doctorate degree	6	2.8
<b>Employment</b>		
Yes	149	69.7
No	65	30.3
<b>City</b>		
Ankara	69	32.2
İstanbul	56	26.1
Other cities	89	41.7

A 6-step process was followed for making the visual stimuli: 1) previously used visual stimuli in BK effect studies were examined, 2) shapes were manually drawn on Microsoft PowerPoint (Microsoft, USA), 3) the first of these figures has seven long sections with rounded, oval endings (without corners), 4) the second figure has 8 long sections with sharp endings, 5) the dimensions of both shapes are set to 9.51 cm X 10.05 cm, 6) the sharp shape represents “kiki”, the rounded shape represents “bouba” (Figure 1).<sup>7,13,14</sup>

## AUDITORY STIMULI

While looking at the visual stimuli in Figure 1, participants simultaneously listened to the expressions “kiki” and “bouba” as audio recordings. The auditory stimuli were recorded by the first author of this study (H.T.U) with a MacBook Air (Apple, USA) (13 inch 2017). The audio recordings were edited in the PRAAT Acoustic Analysis Program.<sup>15</sup> Spectro-

grams and waveforms of the recordings are presented in the Appendix 1.

## PROCEDURES AND DATA COLLECTION

Two preliminary training trials were conducted before presentation of the main trials. After the training trials, responses to two test trials were collected. Stimulus presentation was randomized between participants. Half of the participants heard the word “bouba” first, the other half heard the word “kiki” first. The stimuli were presented via Google Forms (Google LLC, USA). A consent form, stimuli for the training trials, and the demographic information form were included at the beginning. In the demographic information form, information about age, gender, education level and general health status of the participants was obtained. Participants who read the consent form and ticked the checkbox were included in the study. The entire process took approximately 5 minutes. Data collection was completed in two months.

## STATISTICAL ANALYSIS

Data obtained from Google Forms were transferred to Microsoft Excel (Microsoft, USA) spreadsheet. Descriptive statistics were obtained by using the IBM SPSS 23.00 package program (IBM, USA). Descriptive statistics included the range, standard deviation, percentile, and mean values.

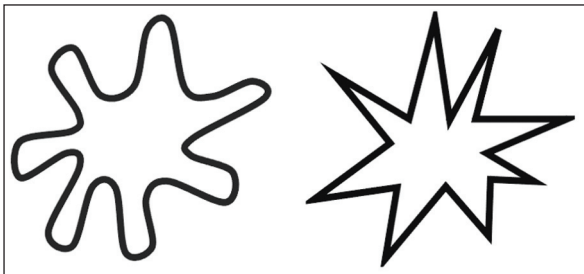
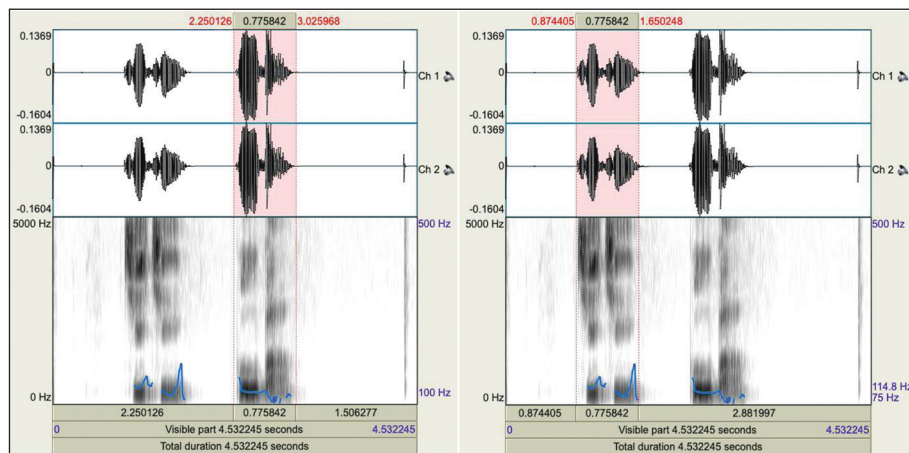


FIGURE 1: Oval (left) and sharp (right) drawings for the bouba-kiki effect.



APPENDIX 1: Praat records of the auditory stimuli.

“Bouba” spectrogram and waveform

“Kiki” spectrogram and waveform

## RESULTS

### DESCRIPTIVE RESULTS OF THE PARTICIPANTS

Of the total participants, 81.7% were female and 18.3% were male. In terms of education, participation numbers ranging from highest to lowest was from undergraduates, high school graduates, and higher-education graduates. More than half of the participants in the study reported being employed. Participants were from 41 different cities in Türkiye such as Ankara and İstanbul. Characteristics of the participants are presented in [Table 1](#).

### DESCRIPTIVE RESULTS OF THE BK EFFECT

All participants completed the two training trials with success. For the two test trials, 67.7% of participants correctly identified kiki as the sharp shape, and bouba as the oval shape. Conversely, 32.3% of participants identified kiki as the oval shape and bouba as the sharp shape. Results of the second trial were similar to the first; 64.4% of participants identified kiki as the sharp shape and bouba as the oval shape, and 32.3% identified kiki as the oval shape and bouba as the sharp shape. Numerical data of the trials are summarized in [Table 2](#).

## DISCUSSION

This study examined the BK effect in healthy Turkish-speaking adults. The main findings of the study showed that the visual shape of “kiki” is sharp/pointy, and the visual shape of “bouba” is oval/round. Our findings are in parallel with those of other studies in the literature on the visualization of phonetic properties of nonsense words.<sup>1,2</sup> Bremner et al. reported that the BK effect is seen in illiterate, Himba speaking individuals.<sup>5</sup> In another study with Taiwanese participants, the presence of the BK effect was documented even with stimuli written in a language different than their own.<sup>10</sup> The same results have been confirmed in multilingual societies, as evidenced by a meta-analysis.<sup>11</sup>

In our study, we found a strong BK effect in healthy Turkish-speaking adults, confirming findings that the BK effect is consistent across languages. Previously, Ćwiek et al. conducted a

**TABLE 2:** Responses of the participants (n=214).

First test trial		
Figure and sound match	Number of participants	%
Kiki-sharp, Bouba-oval	145	67.7
Kiki-oval, Bouba-sharp	69	32.3
Second test trial		
Figure and sound match	Number of participants	%
Kiki-sharp, Bouba-oval	138	64.4
Kiki-oval, Bouba-sharp	76	35.6

cross-cultural BK effect study with 25 different languages including Turkish.<sup>6</sup> They found a limited BK effect in Turkish-speaking participants. In our study, we found a robust effect of the BK effect in Turkish. One reason for this difference may be attributed to the fact that stimuli in Ćwiek et al.’s study were produced by a Polish speaker.<sup>6</sup> In our study, the auditory stimuli were recorded and presented in the voice of a native Turkish speaker (i.e., the first author). Thus, it is possible that subtle language-specific differences influence the strength of the BK effect. Sample size may have been another influencing factor for the differences between the studies. Ćwiek et al. had 38 Turkish-speaking participants in their study, whereas we included 214 participants.<sup>6</sup> A larger sample size appears to reveal a better depiction of the BK effect in Turkish.

In a meta-analysis study conducted by Styles and Gawne, the authors state that the BK effect is not observed in individuals in Nepal and that there may be exceptions.<sup>11</sup> Likewise, participants in Papua New Guinea did not show an effect.<sup>12</sup> Styles and Gawne concluded that the features found in nonsense words may not be compatible with the language characteristics the sample they analyzed.<sup>11</sup> With these exceptions in mind, the presence of a BK effect in Turkish-speaking adults may suggest that the nature of the Turkish language differs from the languages in Nepal and Papua New Guinea. Cuskley and Kirby suggest that multiple trials should be performed instead of a single test trial in order to distinguish between orthographic and phonological features.<sup>9</sup> Thus the inclusion of two training trials and two test trials appears to be one of the strengths of our study. Another advantageous distinction of our study is the in-

clusion of participants from 41 different cities in Türkiye. As a result of its multinational structure, Türkiye has a wide range of dialects. The finding of a strong BK effect despite this variability is evidence that there is an underlying similarity across dialects in the Turkish language.

There are some limitations to our study as well. First, a larger sample size may have revealed an even stronger effect. Although the number of our participants (n=214) is higher than the other studies mentioned above, it may not be sufficient to generalize the results. The second limitation is the gender imbalance among the participants; male participants are approximately notably less than female participants. Similarly, age and educational levels are skewed.

Future research can make comparisons across different age and education-level groups to examine whether these factors have meaningful contributions to the BK effect. Another important avenue of research may be to examine the BK effect in various disorders (e.g., stuttering, speech sound disorders, and/or language disorders) and how individuals with these disorders may differ from healthy controls. As Ramachandran and Hubbard stated, the BK effect may be among the important markers for language acquisition.<sup>1</sup> In this direction, this study can be repeated in individuals with a developmental language disorder who exhibit difficulty with language acquisition processes.

## CONCLUSION

Normative data obtained from Turkish-speaking adults confirm the existence of the BK effect.

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*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea/Concept:** Mariam Kavakci, Halil Tayyip Uysal; **Design:** Halil Tayyip Uysal; **Control/Supervision:** Mariam Kavakci, Halil Tayyip Uysal; **Data Collection and/or Processing:** Mariam Kavakci, Halil Tayyip Uysal; **Analysis and/or Interpretation:** Mariam Kavakci, Halil Tayyip Uysal; **Literature Review:** Halil Tayyip Uysal; **Writing the Article:** Halil Tayyip Uysal; **Critical Review:** Mariam Kavakci; **References and Fundings:** Mariam Kavakci, Halil Tayyip Uysal; **Materials:** Halil Tayyip Uysal.

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