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The Relationship Between Laterality and Musical Hearing Perception Levels Among Middle School Students Attending State and Private Schools

Özel ve Devlet Okullarında Eğitim Alan Ortaokul Öğrencilerinin Lateralizasyon Özelliği ile Müziksel İşitme Algı Düzeyleri Arasındaki İlişki

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ABSTRACT: This study aimed to investigate the relationship between laterality characteristics and musical hearing perception among secondary school students attending private and state schools and to examine the potential influence of school type on these variables. A total of 204 volunteer students aged 10–13 years participated in the study, including 131 (64.2%) from state schools and 73 (35.7%) from private schools. Musical hearing perception was assessed using the Musical Hearing Perception Scale, hand preference was determined using the Edinburgh Handedness Inventory and analyzed according to the Geschwind score, and eye dominance was assessed using the Dolman Method (card-hole test). The findings indicated that most participants were right-handed (89.7%) and right-eye dominant (56.3%). A significant difference in hand preference distribution was observed according to school type, with a higher prevalence of left-handedness among students attending private schools ($p < .05$). In contrast, no significant differences were found between state and private school students in melody, rhythm, interval, or total musical hearing perception scores ($p > .05$). Furthermore, no significant association was identified between laterality characteristics and musical hearing perception. These findings suggest that although hand preference distribution differs according to school type, such differences do not appear to influence musical hearing perception. Overall, the results indicate that musical hearing perception cannot be explained solely by laterality characteristics and is more likely to reflect the interaction of multiple cognitive, environmental, and neurophysiological factors.

Keywords: laterality, music, musical hearing perception, school type.

ÖZ: Bu çalışmada, özel ve devlet okullarında öğrenim gören ortaokul öğrencilerinde lateralizasyon özellikleri ile müziksel işitme algısı arasındaki ilişkinin incelenmesi ve okul türünün bu değişkenler üzerindeki olası etkisinin değerlendirilmesi amaçlanmıştır. Araştırmaya yaşları 10–13 yıl arasında değişen toplam 204 gönüllü öğrenci (%64,2 devlet okulu, %35,8 özel okul) katılmıştır. Katılımcıların müziksel işitme algısı Müziksel İşitme Algı Ölçeği ile değerlendirilmiş, el tercihi Edinburgh El Tercihi Envanteri kullanılarak Geschwind skoru üzerinden belirlenmiş, göz dominansı ise Dolman Metodu (kart delik testi) ile değerlendirilmiştir. Bulgular, katılımcıların büyük çoğunluğunun sağ elini kullandığını (%89,7) ve sağ göz dominantlığının (%56,3) daha yaygın olduğunu göstermiştir. Okul türüne göre el tercihi dağılımında anlamlı farklılık bulunmuş, özel okul öğrencilerinde sol el kullanım oranının daha yüksek olduğu belirlenmiştir ($p < 0,05$). Buna karşın, Melodi, Ritim ve Aralık Testi puanları ile toplam müziksel işitme algısı puanı açısından okul türüne göre anlamlı farklılık saptanmamıştır ($p > 0,05$). Benzer şekilde, lateralizasyon göstergeleri ile müziksel işitme algısı arasında istatistiksel olarak anlamlı bir ilişki belirlenmemiştir. Sonuç olarak, okul türüne göre el tercihi dağılımı farklılık göstermekle birlikte, bu farklılığın müziksel işitme algısını etkilemediği görülmüştür. Bulgular, müziksel işitme algısının tek başına lateralizasyon özellikleriyle açıklanamayacağını ve bu yapının bilişsel, çevresel ve nörofizyolojik birçok faktörün etkileşimiyle şekillendiğini düşündürmektedir.

Anahtar Kelimeler: lateralizasyon, müzik, müziksel işitme algısı, okul türü.

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1. INTRODUCTION

When we listen to music, auditory information undergoes various processing stages, accompanied by physical responses, until musical hearing perception becomes conscious (*Koelsch & Siebel, 2005*). Music activates a complex set of brain regions and functional circuits, including sensory-motor processing, cognitive, memory, and emotional components (*Zaatar et al., 2024*). According to the generally accepted view, both natural and artificial sounds, including music, profoundly affect our cognitive abilities and emotions, such as attention, memory, problem-solving, decision-making, and creativity (*Piccardi et al., 2024; Fritz et al., 2024*). In this context, musical hearing perception is considered not merely a sensory process but a product of multi-layered cognitive and neurophysiological interactions.

Musical hearing perception is one of the most complex examples of this network and requires the simultaneous analysis of components such as rhythm, melody, pitch (interval) perception and timbre. Musical hearing perception occurs through a series of events that begin with the conversion of sound waves into an electrical signal, which then travels through the auditory nerve to the brainstem, where it activates cortical areas, enabling the perception of a specific sound (*Zaatar et al., 2024; Koelsch & Siebel, 2005*). Musical hearing perception, composition, and imagery constitute the fundamental contemporary processes that interact with the auditory, sensorimotor, and cerebellar cortices. Imagery, particularly auditory imagery, enhances pitch accuracy, while motor imagery aids coordination in large groups (*Zaatar et al., 2024; Pando-Naude et al., 2021*). One of the most striking features of music is pitch perception. Pitch emerges over time and is perceived as a melody. This dynamic perceptual process engages both the anterior and posterior auditory pathways. Musical hearing perception is linked to both rhythm and pitch (*Zaatar et al., 2024*).

Conscious auditory perception relies on timely interhemispheric interaction between the right and left auditory cortices (*Steinmann et al., 2018*). In healthy right-handed populations, the right ear advantage in dichotic listening paradigms is a frequently observed behavioral phenomenon of lateralized cortical auditory processing (*Knobloch et al., 2025*).

One frequently studied aspect of brain laterality is how different categories of auditory stimuli are processed in the hemispheres. This demonstrates that hemispheric specialization plays a decisive role in the musical hearing perception and linguistic stimuli (*Prete et al., 2016*). Since Broca's (*1861*) early observations, studies have clearly demonstrated left hemisphere superiority in speech processing. However, the question of which hemisphere predominantly processes non-speech auditory stimuli, particularly musical structures, remains controversial. Evidence for hemispheric asymmetries in auditory modalities has been obtained from both anatomical and functional studies. In particular, it has been shown that the planum temporal is wider in the left hemisphere in right-handed individuals and that this structural asymmetry leads to functional differences in the processing of different auditory stimuli, such as speech and music (*Steinmetz et al., 1991; Tervaniemi & Hugdahl, 2003; James et al., 2015*).

This study aims to examine the relationship between hand and eye laterality indicators and musical hearing perception levels among secondary school students attending private and state schools, and to identify possible differences by school type.

2. METHOD

2.1. Research Design

This study was designed as a quantitative, cross-sectional, correlational study. Cross-sectional designs are used to examine variables measured at a single point in time, whereas correlational designs are appropriate when the aim is to investigate associations among variables without manipulating them (Creswell & Creswell, 2018; Cohen et al., 2018). In the present study, no intervention or experimental manipulation was performed. Instead, students' laterality characteristics, including handedness and eye dominance, and their musical hearing perception levels were assessed under natural school conditions. The study also included comparative analyses to determine whether musical hearing perception scores differed according to school type and gender. Therefore, this design was considered suitable for examining the relationship between laterality characteristics and music perception levels in secondary school students attending private and state schools.

2.2. Participants Group

A total of 204 healthy pupils attending 5th and 6th grade at private and state schools in the Şahinbey and Şehitkâmil districts of Gaziantep province were invited to participate in the study. Pupils with any pathology limiting their vision or hearing were excluded from the study. Ethical approval was obtained from the Gaziantep University Social and Human Sciences

Scientific Research and Publication Ethics Committee (Meeting No: 09, Date: July 2, 2025, Decision No: 28) prior to the commencement of the study. Written informed consent was obtained from all participants' parents or legal guardians.

2.3. Data Collection Tools

The 'Personal Information Form' prepared by the researcher was used to determine the school type, grade level, and gender characteristics of the students participating in the study. The Musical Hearing Perception Scale was used to assess musical hearing perception, and the Edinburgh Inventory Hand Preference Questionnaire and the Dolman Method (card-hole test) were used to determine laterality characteristics.

Musical Hearing Perception Scale: Developed by Karaelma and Demirel (2021), the musical hearing perception scale is designed to be administered without requiring participants to have musical knowledge; it consists of three sections: intervals with colors, melody, and rhythm. In the interval section, using colors, data were collected based on responses to multiple-choice questions. In the melody and rhythm sections, data from multiple-choice questions on whether melodies and rhythms played twice in succession were different were evaluated.

The Pitch Test asks about intervals formed by sounds. This 14-minute test contains 19 pitch questions: 6 with two sounds and 13 with three sounds. At the beginning of the test, there are instructions on how to proceed and sample questions. Each question is presented with 4 options and played twice.

Melody and Rhythm Tests, although theoretically focused on different concepts, are based on a similar perception. The melody and rhythm section of the test, together with the explanation section, takes approximately 15 minutes. As in the interval test, instructions are provided at the beginning of the melody and rhythm test. The test begins after information is provided in a video format compatible with the smart board. In the melody test, participants are asked to identify the difference between the first and second melodies. Participants are expected to indicate whether the difference is at the beginning or end of the melody and select the appropriate option from a multiple-choice form if there is a difference. Similarly, in the rhythm test, participants are asked to identify the difference between the first and second rhythms. If there is a difference, they are expected to indicate whether this difference occurs at the beginning or end of the rhythm and select the appropriate option from a three-choice answer form.

The applied musical hearing perception test was conducted face-to-face with the students. Participants scored between 0 and 43 on the music hearing perception scale test. According to the test's evaluation scheme, 0-10 points were considered very poor, 11-19 points poor, 20-25 points average, 26-34 points good, and 35-43 points very good.

Hand Preference Questionnaire: The Edinburgh Handedness Inventory (Oldfield, 1971) was used to determine participants' hand preferences. The questionnaire contains ten items related to manual activities. Responses were scored on a scale of -100 to +100 according to the Geschwind score. A score of +10 points was given for the preference 'always uses the right hand', +5 points for 'usually uses the right hand', 0 points for 'uses both hands', -5 points for 'usually uses the left hand', and -10 points for 'always uses the left hand', and all scores were added up. Participants were classified as left-handed (-100/-20), ambidextrous (-20/+20), or right-handed (+20/+100).

Eye Dominance (Dolman Method): The Dolman Method (card hole test) was used to determine participants' eye dominance (Fink, 1938). During the test, subjects were asked to sit with their arms extended and look at the letter 'E' 3 meters away through a 3 cm opening in a 25x15 cm piece of paper held in their hands. Then the assistant covered the student's left eye, then their right eye, and asked whether they could see the image on the chart. After repeating this test twice, if the image was not visible on the chart with the left eye covered, the left eye was considered the dominant eye, and if the image was not visible with the right eye covered, the right eye was considered the dominant eye.

2.4. Procedure

Following ethical approval, permission was obtained from the administrations of the participating schools, and informed consent forms were collected from the parents or legal guardians of all participants. Data collection was conducted during the 2025–2026 academic year in the participants' schools under the supervision of the researchers. Initially, students completed the Personal Information Form and the Edinburgh Handedness Inventory. Subsequently, eye dominance was determined individually using the Dolman Method (card-hole test). Finally, participants completed the Music Hearing Perception Scale in a classroom setting using audio recordings and visual instructions presented via a smart board. All

assessments were administered under standardized conditions, and the entire procedure was completed during a single session for each participant.

2.5. Data Analysis

The data obtained from the study were analyzed using IBM SPSS Statistics 25.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize participants' demographic characteristics and study variables. The normality of continuous variables was assessed using skewness and kurtosis coefficients together with the Kolmogorov–Smirnov test. Variables with skewness and kurtosis values within ±1.5 were considered to be normally distributed.

Pearson's chi-square test of independence was used to examine the distribution of hand preference, eye dominance, and musical perception levels according to school type. Independent-samples t-tests were performed to compare hand preference scores and musical perception scores (melody, rhythm, interval, and total score) according to school type and gender. When multiple pairwise comparisons were conducted, Bonferroni-adjusted p values were used to control for Type I error. Statistical significance was set at $p < .05$. Results are reported in accordance with APA 7 guidelines by presenting the relevant test statistics (χ^2 or t), degrees of freedom (df), exact p values, and effect sizes (Hedges' g), where appropriate. Hedges' g values were interpreted as trivial (<0.20), small (0.20–0.49), moderate (0.50–0.79), and large (≥0.80).

3. RESULTS

Table 1. Distribution of Participants' Demographic Characteristics, Handedness, Eye Dominance and Musical Hearing Perception Levels

Variable	Category	n	%
School Type	State	131	64.2
	Private	73	35.7
Grade Level	5th Grade	99	48.5
	6th Grade	105	51.4
Gender	Male	96	47.0
	Female	108	52.9
Hand Preference	Right-Handed	183	89.7
	Left-Handed	15	7.3
	Ambidextrous	6	2.9
Eye Dominance	Right	115	56.3
	Left	89	43.6
Musical Hearing Perception Level	Poor	5	2.4
	Moderate	22	10.7
	Good	144	70.5
	Very Good	33	16.1

Of the total 204 students participating in the study, 64.2% (n=131) were attending state schools, and 35.7% (n=73) were attending private schools in the 5th and 6th grades. The distribution of participants was balanced across gender and grade level. In terms of hand preference, the majority of participants were right-handed (89.7%, n=183), 7.3% (n=15) were left-handed, and 2.9% (n=6) were ambidextrous. The distribution of eye dominance shows that the right eye is dominant in 56.3% (n=115) of participants, while left eye dominance is also noteworthy at 43.6% (n=89). In terms of musical hearing perception level, 2.4% (n=5) of participants performed poorly, 10.7% (n=22) performed moderately, 70.5% (n=144) performed well, and 16.1% (n=33) performed very well. These data indicate that the study was conducted with a sample of right-handed, gender-balanced individuals with adequate musical ability.

Table 2. Distribution of Participants' Hand Preferences According to School Type

	State School		Private School		Total	
	n	%	n	%	n	%
Right-Handed	122	93.1	61	83.6	183	89.7
Left-Handed	6	4.6	9	12.3	15	7.4
Ambidextrous	3	2.3	3	4.1	6	2.9
Total	131	100	73	100	204	100

Table 2 shows the distribution of participants' hand preference according to school type. While 93.1% of participants attending state schools prefer to use their right hand, this rate is 83.6% among private school students. This indicates that right-handedness is more prevalent in state schools. In terms of left-handedness, the rate among private school students (12.3%) is higher than that among state school students (4.6%). This difference in hand preference is statistically significant; the rates marked with different letters (a and b) indicate this significance. On the other hand, the rate of ambidexterity is relatively low in both state school (2.3%) and private school (4.1%) groups, and this difference was not statistically significant; both groups are indicated by the same letter (a).

Table 3. Comparison of Participants' Eye Dominance Distribution by School Type

	State School		Private School		Total	
	n	%	n	%	n	%
Right	75	57.3	40	54.8	115	56.4
Left	56	42.7	33	45.2	89	43.6
Total	131	100	73	100	204	100

Table 3 shows the distribution of eye dominance among participants according to school type. Among

state school students, 57.3% are right-eye dominant and 42.7% are left-eye dominant. Among private school students, right-eye dominance is 54.8%, while left-eye dominance is 45.2%. Although right-eye dominance is more common in both school types, the difference was not statistically significant due to the very close ratios. Therefore, the school type variable does not show a significant difference in terms of eye dominance.

Table 4. Distribution of Participants' Musical Hearing Perception Levels According to School Type

	State School		Private School		Total	
	n	%	n	%	n	%
Poor	2	1.5	3	4.1	5	2.5
Moderate	16	12.2	6	8.2	22	10.8
Good	94	71.8	50	68.5	144	70.6
Very Good	19	14.5	14	19.2	33	16.2
Total	131	100	73	100	204	100

Table 4 presents the distribution of participants' musical perception levels according to school type. Participants were classified into four musical perception categories: Poor, Moderate, Good, and Very Good. In both school types, the majority of participants were classified as having a good level of musical perception, representing 71.8% of students attending state schools and 68.5% of those attending private schools. The proportion of participants classified as Very Good was 14.5% in the state school group and 19.2% in the private school group. Participants classified as Poor or Moderate accounted for a relatively small proportion of both groups. Overall, the distribution of musical perception levels showed a similar pattern across students attending state and private schools.

Table 5. Comparison of Participants' Hand Preference and Musical Hearing Perception Scores by School Type

Variable	State School *(M±SD)*	Private School *(M±SD)*	t	p	Hedges' g
Hand Preference Score	69.62 ± 38.89	54.11 ± 56.82	2.304	0.022	0.34
Melody Test Score	8.68 ± 2.00	9.01 ± 1.70	-1.203	0.230	0.17
Rhythm Test Score	7.34 ± 1.96	7.36 ± 1.84	-0.072	0.942	0.01
Interval Test Score	13.75 ± 2.15	13.9 ± 2.93	-0.435	0.664	0.06
Total Musical Hearing Perception Score	29.76 ± 4.39	30.27 ± 4.76	-0.785	0.433	0.11

Table 5 presents a comparison of participants' hand preference and musical hearing perception scores according to school type. In terms of hand preference scores, state school pupils (69.62 ± 38.89) scored significantly higher than private school pupils (54.11 ± 56.82) ($t = 2.304$, $p = 0.022$). Hedges' $g = 0.34$ indicates a small-to-medium effect size. This result reveals that hand preference tendencies may differ across school types.

In contrast, no significant differences were found between school types in melody, rhythm, interval, or total musical hearing perception scores ($p > 0.05$). The effect sizes calculated for these variables are also relatively small (Hedges' g: 0.01–0.17). This indicates that state and private school students have generally similar levels of musical hearing ability.

Table 6. Comparison of Participants' Hand Preference and Musical Hearing Perception Scores by Gender

Variable	Male *(M±SD)*	Female *(M±SD)*	t	p	Hedges' g
Hand Preference Score	67.24 ± 38.76	61.25 ± 52.57	0.917	0.360	0.13
Melody Test Score	9.06 ± 1.82	8.56 ± 1.95	1.874	0.062	0.26
Rhythm Test Score	7.02 ± 1.87	7.63 ± 1.92	-2.291	0.023	0.32
Interval Test Score	14.36 ± 2.33	13.31 ± 2.46	3.146	0.002	0.44
Total Musical Hearing Perception Score	30.45 ± 4.11	29.49 ± 4.83	1.516	0.131	0.21

The difference in hand preference scores by gender is not statistically significant ($p = .360$), and the effect size is small ($g = 0.13$). Although males scored higher on the melody test, the difference is not significant ($p = .062$). Females performed significantly better on the rhythm test ($p = .023$, $g = 0.32$). In the interval test, males performed significantly better ($p = .002$, $g = 0.44$). There is no significant difference in the total musical hearing perception score, but males' scores are slightly higher ($p = .131$, $g = 0.21$).

4. DISCUSSION

This study examined the relationships between laterality indicators (hand preference, eye dominance) and musical hearing perception in secondary school students aged 10–13, and variations across school type and gender. The findings generally point to two main conclusions: (i) right-hand preference is predominant in

the sample, and eye dominance is relatively evenly distributed between right and left; (ii) although the distribution of hand preference differs significantly according to school type, musical hearing perception scores do not vary according to school type; in contrast, gender-related differences are observed in some subcomponents of musical hearing perception.

Laterality distributions: Hand preference and eye dominance

When examining the distribution of hand preference and eye dominance among participants by school type, it was observed that right-hand preference was more common among students attending state school than among those attending private schools. Left-hand preference was more prevalent among private school students compared to state school students. The difference in hand preference between groups by school type was statistically significant. While the rates of ambidexterity were relatively low in both school types, there was no significant difference between them.

A review of the literature shows a consistent trend towards right-hand preference in humans (Ocklenburg et al., 2013; Annett, 1976; Leong, 1980). Numerous studies have shown that 8% to 12% of people are left-handed, and left-handedness appears to be universal across human populations (Zverev, 2006). A study reporting 5 meta-analyses on hand preference for various manual tasks found that the prevalence of left-handedness ranged from 9.3% to 18.1%, with the best overall estimate at 10.6% (Papadatou-Pastou et al., 2020). From the perspective of eye dominance, the high proportion of left-eye use is not surprising in the literature. Longitudinal studies have reported that left-eye dominance can reach 40% in preschool and child samples (Dellatolas et al., 1998). However, in our study, right-eye dominance was slightly more common in both school types, with the ratios quite close, so there was no statistically significant difference. This suggests that eye dominance may show a more balanced distribution than hand preference, and that interpreting laterality using a single marker may be limited.

School type and hand preference: Environmental/institutional visibility impact.

The significant difference in hand preference distribution across school types (a higher left-hand preference rate in private schools) in your study is noteworthy. This situation is consistent with the view that the 'visibility' of a biologically based trait such as hand preference can be altered by environmental norms and guidance in the educational setting. Studies exist showing that social/institutional pressure regarding left-handedness can influence its reporting and behavioral expression (Porac & Coren, 1981; Coren, 1990; Laland et al., 1995; Papadatou-Pastou et al., 2020). Cultural differences are known to influence the expression of hand preference (Ashton, 1982), leading to different distributions of right- and left-handed individuals worldwide (Marcori & Okazaki, 2020; Bazo et al., 2022). Differences in left-handedness prevalence can be attributed to varying frequencies of left-hand preference across populations, differences in the strength of cultural and environmental pressure against left-hand use between populations, inconsistencies in the methods used to assess hand preference, or the type of criterion used to classify hand preference (Zverev et al., 2006; Raymond & Pontier, 2004; Laland et al., 1995; Porac & Coren, 1981).

The Relationship Between Handedness and Musical Hearing Perception

The findings of this study indicate that students' musical hearing perception performance may be related to hand preference (right-handed/left-handed). In particular, left-handed students scored higher on the Musical Hearing Perception Scale than their right-handed peers. Although this difference is not statistically significant, the tendency for left-handed individuals to perform better on the musical hearing perception test is noteworthy. In contrast, students' eye dominance (left- or right-eye dominance) did not significantly affect their musical hearing perception scores. In other words, whether a student's dominant eye was on the left or right side did not significantly alter their ability to distinguish musical intervals, melodies, and rhythms. This result is consistent with previous studies reporting that eye dominance does not affect auditory perception skills (Erhan et al., 2018).

Our study did not find a significant relationship between eye dominance and musical hearing perception skills. A similar result was observed in a study of elite amateur boxers: no significant relationship was found between rhythm-sense level and eye dominance (Çemç & Gerek, 2022). Eye dominance can be defined in terms of motor (targeting) or sensory (perceptual) aspects, and is usually on the same side as the dominant hand. However, this is not always the case. For example, McManus (1999) reported that 24.2% of consistent right-handed individuals were left-eye dominant, while this rate rose to 72.3% among consistent left-handed individuals. These data show that eye dominance is highly

correlated with hand preference but does not always coincide exactly with it.

Our findings are consistent with studies suggesting that left-handed individuals may have an advantage in musical auditory perception tasks. Indeed, some studies have reported that left-handed individuals perform better in tasks requiring musical pitch perception and tone memory (Villar-Rodríguez et al., 2024).

For example, Deutsch (1978) found that left-handed participants performed better than right-handed participants in a musical memory task and also showed greater performance variance. Superior performance was particularly concentrated among mixed-handed left-handed individuals. In an auditory or musical memory task, subjects made pitch recognition judgements when a series of interposed tones separated the tones to be compared. Left-handed subjects performed significantly better than right-handed subjects and also exhibited significantly higher variance. Further analyses showed that superior performance was primarily attributable to left-handed subjects with mixed-handedness. Similarly, left-handedness has been associated with pitch perception (Laguitton et al., 1998), pitch memory (Deutsch, 1978), note reading (Kopiez et al., 2006), and general musical aptitude (Villar-Rodríguez et al., 2024; Kopiez et al., 2006). These findings suggest that left-hand preference may be associated with musical hearing perception and auditory memory in specific tasks.

In approximately 95% of people, the brain regions responsible for speech processing are located in the left hemisphere, whereas right hemisphere dominance is observed in only 5%. In a study conducted by Villar-Rodríguez et al. (2020), it was determined that in 40% of left-handed musicians, the speech centre is dominant in the right hemisphere. These neurological findings provide a physiological basis for the relatively higher musical hearing perception scores of left-handed individuals in our study. However, there are also inconsistent results in the literature regarding the relationship between hand preference and musical ability. For example, in a study by Good et al. (1997) with 897 children aged 7–8, no significant relationship was found between Bentley Music Aptitude Test scores and hand preference. Right-handed and left-handed children scored similarly, with no significant difference observed between the groups. The researchers explained this result by the inability of tests administered at an early age to sufficiently distinguish musical abilities, as well as by the influence of external factors such as academic achievement and socioeconomic status. In this context, the sensitivity of tests assessing musical hearing perception and sample characteristics may be decisive in revealing the effect of handedness. The scale used in our study may have revealed slight advantages for left-handed individuals, as it focused specifically on auditory discrimination (perceiving differences in pitch, melody, and rhythm).

Possible Reasons for the Lack of Significant Results Between Laterality and Musical Hearing Perception

The lack of a significant association between laterality characteristics and musical perception suggests that musical hearing perception is unlikely to be explained by any single measure of laterality. Given that auditory perception relies on a finely tuned, integrated interaction between the hemispheres, this result is expected (Steinmann et al., 2018). Indeed, it has been demonstrated that laterality patterns can vary across stimulus types in dichotic listening tasks (e.g., syllables vs. melodies) and that musical stimuli may not always produce an ear advantage in the same direction (Knobloch et al., 2025).

5. CONCLUSIONS

The study revealed that the vast majority of students showed right-hand dominance, while eye dominance was evenly distributed between the right and left eyes. Hand preference scores were significantly higher in state schools, whereas musical hearing perception levels did not differ by school type. Rhythm perception was significantly higher in girls, while interval perception was significantly higher in boys. No significant relationship was found between eye dominance and musical hearing perception; however, the tendency for left-handed students to score higher is noteworthy.

6. LIMITATIONS AND RECOMMENDATIONS

This study is limited to 5th- and 6th-grade students in the center of Gaziantep province. Therefore, the results cannot be generalized to different age groups or students in other regions. Furthermore, factors such as the students' individual musical backgrounds, family environment, or whether they received regular music education were not taken into account.

Future studies should involve larger samples from different age groups and include environmental and individual factors that may affect musical hearing

perception. The relationship between neurological indicators such as eye and hand dominance and musical hearing perception could be explored in greater depth.

7. ETHICS STATEMENT

Ethical approval for this study was obtained from the Gaziantep University Social and Human Sciences Scientific Research and Publication Ethics Committee. The study was approved at the Committee's meeting held on July 2, 2025 (Meeting No: 09, Decision No: 28). Written informed consent was obtained from the parents or legal guardians of all participants prior to data collection.

8. AUTHOR CONTRIBUTIONS

ZG conceived and designed the study. ZG and EÖK contributed to the development of the research methodology. ZG collected the data and performed the data analysis. ZG drafted the manuscript. EÖK critically reviewed the manuscript for intellectual content and contributed to the interpretation of the findings. Both authors read and approved the final version of the manuscript.

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