

Visualization of Pitch in *Slendro* and Diatonic Scales

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ABSTRACT

This study investigates the visual representation of pitch in two musical scales: the diatonic scale and the Javanese Slendro scale. This research shows how scales are perceived and depicted visually by engaging five young adults in a free-drawing study. Using Jakobson's intersemiotic translation for analysis, participants were provided with sound stimuli first and asked to draw their visualization of scales using lines, form, and color. The results revealed that the diatonic scale was consistently represented with structured and sequential visuals, indicating familiarity and linearity. On the other hand, Slendro was visualised with more significant variability and fluidity. This study shows that the visual representation of the musical element of pitch does not stand alone but is also influenced by the musical scale and the listener's familiarity with it.

Keywords: visual representation, musical scales, diatonic, slendro, cultural perception

ABSTRAK

Penelitian ini merupakan upaya untuk melihat representasi visual nada dalam dua skala musik: skala Diatonis dan skala Slendro Jawa. Dengan melibatkan lima orang dewasa berusia 18-25 tahun dalam *free-drawing study*, penelitian ini mengeksplorasi bagaimana nada-nada tersebut dipersepsi dan digambarkan secara visual. Metode pengumpulan data pada studi ini meliputi studi gambar bebas dan wawancara pada 5 orang partisipan, serta transaksi intersemiotika Jakobson sebagai metode analisisnya. Hasil dari penelitian ini adalah tangga nada Diatonis secara konsisten direpresentasikan dengan visual yang terstruktur dan berurutan, menunjukkan keakraban pendengar dan linearitas. Sebaliknya, tangga nada Slendro divisualisasikan dengan variabilitas dan fluiditas yang lebih besar. Studi ini memperlihatkan bahwa representasi visual elemen musik *pitch* tidak berdiri sendiri, namun juga dipengaruhi oleh tangga nada (*scale*) dan familiaritas pendengarnya.

Kata kunci: representasi visual, tangga nada musik, diatonic, slendro, persepsi budaya

INTRODUCTION

Art is a medium for expressing an artist's ideas, thoughts, and feelings. Artworks can be enjoyed visually through the sense of sight, audibly through the sense of hearing, or through a combination of both. There are also art forms that blend two or three of these

aspects. All these types of artworks carry their messages intended for their audiences. As art evolves, so do the mediums that mediate it. Art is not confined to a single medium but allows other mediums besides the visual to develop and collaborate, even transitioning between forms. In art, transitioning between forms

(*alih wahana*) refers to transferring from one type of artwork to another (Damono, 2018). In its role within culture, this transition can serve as a medium for cultural dissemination that will be useful for culture preservation. This transition can be applied to various mediums, from visual arts to writing or vice versa, or from musical arts to visual arts, where these two disciplines differ. The existence of transitions within artworks allows art to demonstrate its interrelation by breaking the disciplinary boundaries established in the modern era.

The interrelation among the branches of art, such as painting, sculpture, music, architecture, dance, and even film, is widely discussed within the realm of aesthetics. This can be seen in the history of the Music of the Spheres, or *Musica Universalis*. This ancient philosophy connects the harmony of music and mathematics with the movement of celestial bodies. In his book, "The Republic," Plato stated that the solar system moves with its colors and sounds. This theory has been contested by other scientists who found their connections between music and visual forms. However, the relationship between music and visuals holds mysteries yet to be fully unveiled, leaving room for further research, especially concerning culture.

Some interesting views on the interrelation between the branches of art include those of Adorno and Gillespie (1995) in their work titled "On Some Relationships between Music and Painting," which discusses the context of visual arts, such as paintings and music. Music and visual art are said to be connected in the third dimension, namely, language. Siswadi (2013) also stated that any artwork is a text. These

artistic texts use language appropriate to their respective fields. Therefore, some texts use verbal, musical, movement, and even visual language. In various views and debates on the relationship between the visual and music, it becomes fascinating when the 'language' of visual music—the third dimension mentioned by Adorno and Gillespie (1995), like neumes (essential elements of the musical notation system)—is associated with the music itself. In neumes, the visual representation is not just a sign for music but also resembles the music itself. This is inseparable from the local cultural aspects of the society that owns the notation. The differences in neumes across regions reflect that the visual representation of ancient music, represented as graphic notation, is influenced by its local culture.

As stated above, a *neume* is the essential element of the earliest systems of musical notation in the Western world. Originating in the early medieval period, neumes were signs written above the lyrics of chants or other vocal music to indicate the direction of the melody or changes in pitch. Pitch is sound with a clear and identifiable tone, and it can be recognized as particular notes (high or low) in the musical scale. They represent one of the first attempts to capture musical sounds in written form, marking a significant departure from purely oral traditions of music transmission (Levy, 1987).

Musical notation, more broadly, is a system of symbols used to represent the elements of music, including pitch, rhythm, dynamics, and timbre. Over centuries, musical notation has evolved from simple *neumes* to the complex and precise systems

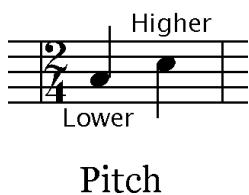


Figure 1. The visualization of pitch in modern music notation



Figure 2. Nut Rante in the 1800s (left) and Western Notation in the 1800s (right)

used today, which can accurately convey a composer's intentions to the performer. Looking at the history of musical notations and neumes, regional variations significantly influenced neumes. Different areas developed their unique styles of *neumatic* notation, reflecting local musical traditions and practices. This regional diversity underscores how cultural aspects profoundly influenced the notation system. In his essay "Notation Interpretation, etc." Cardew (1961) implicitly explains that musical notation (or neumes) reflects the understanding that the creation, interpretation, and changing perspectives on music are heavily influenced by the cultural context of a society. Therefore, notation is used to communicate musical elements such as pitch, tempo, dynamics, and others, which evolve in response to the needs, conventions, and innovations of their cultural environment. In short, a notation system will adapt to the musical requirements of its society.

While the standardization of musical notation in the 1800s created a universal language for music that goes beyond regional and cultural boundaries, this does not mean that the diversity of musical expressions and notations should be replaced. According to Schuiling (2019), Nicholas Cook and Philip

Bohlman criticized the prioritization of written scores as the primary representation of music as vision-centered, and it can lead to distortions of understanding music history and marginalization of non-Western musical traditions. Non-Western musical traditions that might rely more on oral transmission or different forms of notation are marginalized by enforcing a universal standard of written notation as the benchmark for musical value.

The creation and development of music within a community cannot be separated from various aspects or elements present in that society, including community dynamics (Ikhwan, 2023). In the case of Indonesia's musical history, Indonesia's written notation was called *Nut Rante*. *Nut Rante*, which translates to "chain notation" because its appearance resembles chains, was developed during the second half of the 19th century to notate gamelan compositions. This period was marked by attempts to document and preserve the musical traditions of Java, which had until then been transmitted orally.

The development of *Nut Rante* can

be attributed to efforts by Javanese court musicians (*musisi kerajaan*) to design systems for notating *gendhing*, the term for gamelan compositions. The *Nut Rante* notation in Figure 2 (left) represents the oldest visual representation designated for Javanese *gamelan* (a type of Javanese music). Compared to Western notation of the time (Figure 2, right), there was an adaptation from Western notation as a visual representation of music, with some elements retained and adjusted to suit the *gamelan* music of Java at the time (Ishida, 2010). *Nut Rante* also used staff lines similar to Western notation and has the direction of melody movement from left to right, just like Western notation. However, there were some changes. Among these are related to the scale, where Western notation uses do (1) re (2) mi (3) fa (4) sol (5) la (6) si (7) do (1), while Javanese notation uses *Slendro* (1 2 3 5 6 1) & *pelog*: thus, the staff lines used accommodate the *pelog* and *Slendro* scales. Regarding bar lines, in *Nut Rante*, there are no bar lines like in Western notation because of the difference in song structure. Javanese songs tend to have a cyclical cycle and are more flexible in their phrasing. Viewing this historical phenomenon, the process of translating music into visuals is an influence of colonialism at the time that wanted to record various oral traditions. This is a form of acculturation where external influences are absorbed and adjusted to local cultural practices. After *Nut Rante*, *Nut Angka* (also known as *Kepatihan*) was created. This notation is based on the numbers, and it has been used until now besides modern music notation.

This article takes a closer look at the

journey from old Javanese music writing, like *Nut Rante*, to its newer form, *Nut Angka*, showing us how music and art have always been connected in Java. This story is not only about old traditions, but it is a stepping stone to understanding how people in Java today see and mix music with visuals. By looking back at how *Nut Rante* was formed, we can look into what modern Javanese people think about when they interpret tunes with images. This research aims to look at the relationship between musical elements and visual elements according to the perspectives of modern Javanese people to see the visual symbolized thinking of modern Javanese people in perceiving musical elements. The musical element studied in this research is explicitly pitch, which is arranged in a specific sequence called a scale. Pitch is a fundamental aspect of music that transcends cultural and stylistic boundaries, making it a universal component of musical experiences. Its variability, from low to high frequencies, offers a broad spectrum for exploration in visual translation. Specifically, the investigation into pitch arrangements (scale) in this study is not limited to a generic understanding; instead, it examines pitch across two types of scale: a) the pentatonic *Slendro* as the representative for Javanese music scale and b) the diatonic scale. This choice of scales type is significant, as these scales represent fundamental aspects of Javanese musical tradition and the broader context of global music theory. The pentatonic *Slendro* and *Pelog* scales are essential to Javanese music, portraying the tonal characteristics and cultural identity of Javanese music.

The *Slendro* scale is a musical scale with a pattern of intervals of relatively the same length (evenly spaced) between one note and the next. In the *Slendro* scale, the sequence of notes consists of five tones in an octave, with a pattern of distances almost evenly spaced: 1-2-3-5-6-1.

The names of the notes used in the *Slendro* scale are.

- a. *Penunggul (barang)*, given the number symbol one (1), read as *siji*, abbreviated as *ji*.
- b. *Gulu (jangga)*, given the number symbol two (2), read as *loro* or *ro*.
- c. *Dhadha (jaja)*, given the number symbol three (3), read as *telu* or *lu*.
- d. *Lima*, given the number symbol five (5) and read as *lima* or *ma*.
- e. *Enem*, given the number symbol six (6), and read as *nem*.

On the other hand, the inclusion of the diatonic scale which is widely used in Western music, allows us to have a cross-cultural comparison (Kurniatun, 2013). The diatonic scale is a system of notes consisting of seven tones in one octave: do-re-mi-fa-sol-la-si-do, which is 1-2-3-4-5-6-7-1 (back to do again). These scales are used in modern and contemporary songs and are very familiar in Western music (Zidan & Utami, 2023). Though Western compositions use diatonic scales a lot, the *Slendro* scale is not used only in Javanese traditional music. In the 1800s, Debussy's composition might have been influenced by this scale after his encounter with Javanese music at Exposition *Universelle* in Paris. Adapting scales resembling *Slendro* shows a departure from Western music to a broader

approach (Mueller, 1986).

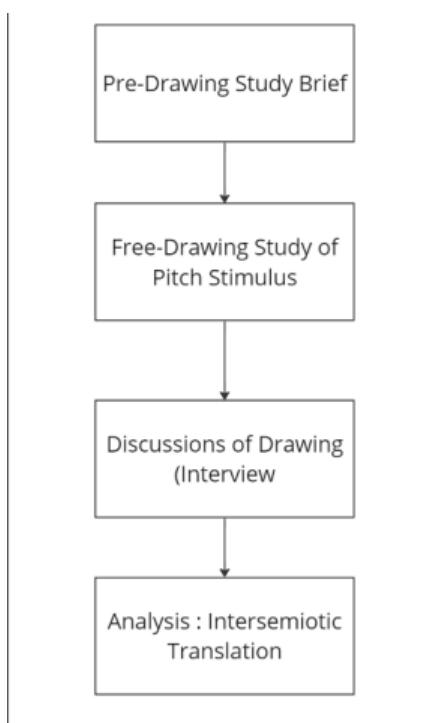
Therefore, this comparative analysis can give an understanding of how pitch is perceived and represented visually across cultural boundaries, as it provides insights into musical interpretation's universal and culturally specific aspects. By examining these scales, we can uncover the diverse ways modern Javanese people symbolize and conceptualize pitch.

The results of this research can be used to develop local notation, graphic notation to express music and art, music learning, and music-based creation. Nowadays, graphic notation is believed to be flexible and has the potential for innovation in contemporary musical practices (Hope, 2020). Therefore, this research can support new forms of music and make music more accessible to a broader audience without formal music training (inclusive).

METHOD

This is qualitative and descriptive research as it focuses on understanding phenomena from a holistic view. Qualitative research, as described by Creswell & Creswell (2023), emphasises that researchers are the fundamental instrument collecting data through documents, interviews, or observations. The data can be varied, such as interview data, observations, or pictures, and the researcher organizes them into themes and categories.

In this research, the researcher explores and observes the participants' responses in translating the language of music into

**Figure 3. Methodological Framework**

visual imagery. The method used for the participants to translate is through a free-drawing study. The free-drawing study shows how adults translate music elements to visual art because it enables participants to express their interpretations of music through drawings freely. In this case, the drawings and participants' verbal reflections on their works can provide a rich dataset, which aligns with Creswell's methodological framework that values the complexity of qualitative data.

Figure 3 shows the methodology used in this study. The steps of the methods of data collection involve a) a pre-study brief, in which, in this part, the researcher gives information about visual elements and musical elements, and b) a free-drawing study of musical element stimuli. In this section, the researcher gives the participants a sound stimulus for the participants to draw, and

Table 1. Participant list

Participant	Gender	Musical Background
1	Female	No
2	Male	Yes
3	Female	No
4	Male	No
5	Female	Yes

the last one is c) an interview of participants regarding the drawings. The musical element that is covered in this article is Pitch. Therefore, in this experiment, the researcher gives the participant a stimulus of two different pitches (low to high and high to low pitch), and they can draw it based on their perception. The participants were asked to draw their perception with certain visual elements: a) Lines, b) Form c) Color. After the free-drawing study and interview, the researcher analyses the drawing using NVivo and intersemiotic translation.

The participants chosen for this free-drawing study are purposive. They consist of 5 young adults between 18 and 25 years old, who are varied in gender (2 males and three females). However, the genders are not used as variables in this study. The details of the participants are in the table 1.

We picked different musical backgrounds for the participants to see a wider range of perceptual visual responses in the free-drawing study. By involving both individuals with and without formal musical experience, the study can explore whether musical training influences the way participants visually

interpret musical elements such as melody.

The age group 18-25 is chosen because this group is considered early adulthood. In this phase, individuals are open to external experiences, more sensitive, and able to identify culture, all of which contribute to the development of creativity (Laycraft, 2012 ; Dabrowski, 1996).

Jakobson's intersemiotic translation is used as an analysis method for this research because Intersemiotic Translation (IT) facilitates the exploration of how abstract musical concepts and elements are visually symbolized and interpreted, reflecting the relationship between sound and sight. According to Dusi (2015), Intersemiotic Translation does not only mean investigating the differences between the two semiotic systems but also analyzing their similarities. The use of IT in this study allows us to see how the translation process is across different forms of art and highlights the subjective interpretation of the participants of the free drawing study and their cultural backgrounds.

RESULT AND DISCUSSION

Sound Stimuli for Drawing Study

In this study, the author used two types of stimuli to portray the musical elements' 'pitch'. The term 'pitch' is defined as the perceived frequency of a note, which also determines whether the note is high or low. The sound stimuli in this study are chosen for their scale differences (Sound A is the Diatonic Ascending and Diatonic Ascending melody; Sound B is the *Slendro* Ascending and *Slendro* Ascending melody).

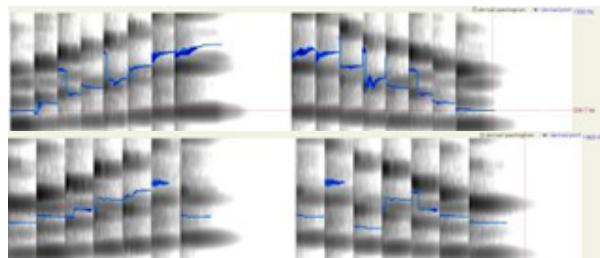


Figure 4. The Spectrogram and Pitch visualization of Sound A (above) and Sound B (bottom).

The sound stimuli can be found here: <https://drive.google.com/drive/folders/1vDEr0EwYxf8EKZ769YUr5y7515auAh-i>.

Figure 4 shows the visual representation of the sound stimuli from Praat Software. Praat software is computer software that analyzes speech. It is usually used in linguistics, but in this study, the author used it to detect the frequency of the pitch.

The author also collected the frequency of each sound stimulus to create an objective study. Sound A was based on the diatonic scale, while Sound B was based on the *Slendro* scale.

Table 2 shows the frequency of the note in each stimulus. Sound B was based on the *Slendro* scale, and this frequency was based on Hanggar Budi Prasetya's book "*Fisika Bunyi Gamelan: Laras, Tuning, dan Spektrum*" which stated the average frequency of *Slendro* tuning from 28 types of *gamelan* (Prasetya, 2012). As seen in the table, the frequencies for each sound stimulus ascend from lower to higher frequencies and then return to the starting frequency.

In this article, the sound stimuli were chosen in ascending and descending versions to examine how participants perceive and

Table 2. Frequency of Sound A and Sound B

Sound A		Sound B	
Note	Frequency	Note	Frequency
1 st	523.251 Hz	1 st	233.08 Hz
2 nd	587.33 Hz	2 nd	277.18 Hz
3 rd	659.3 Hz	3 rd	312.1078 Hz
4 th	698.46 Hz	4 th	358.3255 Hz
5 th	784.0 Hz	5 th	413.054 Hz
6 th	880.0 Hz	6 th	475.3366 Hz
7 th	987.8 Hz	7 th	549.9637 Hz
8 th	1047 Hz	8 th	549.9637 Hz
9 th	1047 Hz	9 th	475.3366 Hz
10 th	987.8 Hz	10 th	413.054 Hz
11 th	880.0 Hz	11 th	358.3255 Hz
12 th	784.0 Hz	12 th	312.1078 Hz
13 th	698.46 Hz	13 th	277.18 Hz
14 th	659.3 Hz	14 th	233.08 Hz
15 th	587.33 Hz		
16 th	523.251 Hz		

respond to changes in pitch direction. By presenting both ascending and descending melodies for each type of scale (Diatonic and *Slendro*), the study investigated whether there are differences in how individuals perceive and process pitch changes within each scale system. This approach allowed the researcher to explore whether participants exhibit similar responses to ascending and descending

melodies within the same scale or if there are differences in perception based on the direction of pitch change.

Drawing Study and Interview Results

The author collected eight sets of images based on the participants' visual responses to the Diatonic and *Slendro* Scale. Each set consisted of 3 pictures: a line visual response, a form visual response, and a color visual response. These different elements were used based on the visual elements found in visual art.

The images are categorized based on the visual element in the table 3, 4 and 5. Tables 3, 4, and 5 show the five participants' visual responses after listening to Scale Diatonic and Scale *Slendro*. These drawings were coded in NVivo Software and described in the text to create a theme.

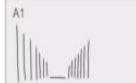
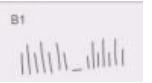
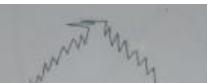
Intersemiotic Translation: Interpretation of Visual Responses

The intersemiotic translation process in this section is based on the results of a free-drawing study. Jakobson's intersemiotic translations guide this process by finding equivalence in the differences between the drawings and the cultural context. The author started by describing every drawing of the participants and then coded them in NVivo to see if the pattern occurred.

Lines

The line drawings revealed distinct patterns between the two scales. For the diatonic scale, participants used smooth, continuous lines to represent the progression

Table 3. Visual Element 'Lines' Representing Scale

P	G	Mb	Diatonic Scale	Slendro Scale
1	F	N		
2	M	Y		
3	F	N		
4	M	N		
5	F	Y		

P = Participant

G= Gender (F=Female, M=Male)

Mb=Musical background (N=No, Y=Yes)

Table 4. Visual Element 'Form' Representing Scale

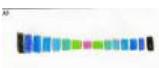
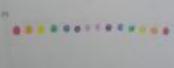
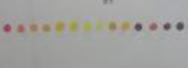
P	G	Mb	Diatonic	Slendro
1	F	N		
2	M	Y		
3	F	N		
4	M	N		
5	F	Y		

P = Participant

G= Gender (F=Female, M=Male)

Mb=Musical background (N=No, Y=Yes)

Table 5. Visual Element 'Color' Representing Scale

P	G	Mb	Diatonic	Slendro
1	F	N		
2	M	Y		
3	F	N		
4	M	N		
5	F	Y		

P = Participant

G= Gender (F=Female, M=Male)

Mb=Musical background (N=No, Y=Yes)

of notes and some ladder-like lines to show the low and high notes. Of five participants, despite the musical background and gender, four have similar types of visual responses in drawing lines. P2, P3, P4, P5 started the line from the lower part of the paper, reached a peak, and went down again, just like how the notes sound (low-high-low). However, P1 drew the opposite. P1 drew the tall lines for lower sounds and shorter lines for higher notes. These visual responses depicted in lines mostly showed clear steps or gradations, reflecting the sequential nature of the diatonic scale (do-re-mi-fa-sol-la-si-do, do-si-la-sol-fa-mi-re-do).

In contrast, the *Slendro* scale drawings exhibited more varied and sometimes curved

lines, indicating the unique intervals and the less rigid structure of the *Slendro* scale. Participants with a musical background tended to produce more precise and orderly line representations for both scales, while those without a musical background had more abstract and varied interpretations. However, P4, who claimed to have no musical background, also drew lines in order. *Slendro* Scale was depicted with jagged lines, rough, with sharp points by P4 and P5. Meanwhile, P4 and P5 depicted a Diatonic Scale with ladder-like lines. Another interesting finding was the fact that P3 drew two sets of semi-circular curve lines stacked one above the other. Each set of curves forms a scalloped pattern, with arrows indicating the direction

of the curves. The arrows point upwards on the left set of curves and downwards on the right set of curves. Meanwhile, P3 drew a series of semi-circular curves forming a large, scalloped pattern that creates an arch shape for the Diatonic. The curves start from the bottom left, rise to a middle peak, and descend to the bottom right. This aligns with the interview with P3, who stated that the sound of the *Slendro* scale is odd and mystical.

P3 : *"The sound of this short music is odd, but it makes me shiver. It has a mystical vibe..."*

Other than P3, P1 also depicted *Slendro* as odd and mysterious. It was shown through the drawing of P1, which used vertical and slightly slanted lines of varying lengths arranged in an irregular pattern. There is a horizontal line near the centre, shorter than the vertical lines. The lines do not form any specific shape or pattern and appear randomly placed.

Forms

In terms of form, the visual representations of the Diatonic and *Slendro* scales highlighted distinct differences between the two scales. For the Diatonic scale, P1 used rectangular shapes arranged in a step-like progression from left to right, with the size of the rectangles decreasing, indicating a structured, ladder-like progression (The bigger size indicated the lower note, and the smaller size was the higher note). P3 depicted the Diatonic scale with a series of egg-shaped ovals arranged in an arching pattern, reflecting a smooth and continuous progression. Additionally, one participant used circular shapes arranged in a diagonal line, representing a precise and ordered

sequence of notes. A different participant (P4) chose to illustrate the Diatonic scale with a single large circle, and the interview results indicated unity or completeness. Finally, P5's drawing featured a series of jagged, step-like lines, reflecting a structured progression with clear steps.

In contrast, the *Slendro* scale was depicted with more varied and irregular shapes. P1 used oval shapes arranged in an irregular pattern, accompanied by a long horizontal line, indicating a less structured and more varied progression. Meanwhile, P2 represented the *Slendro* scale with a series of overlapping circles forming an arch, reflecting a more fluid and wavy progression. P2 also stated in the interview that the *Slendro* scale was calming and relaxing in terms of mood, which was why P2 overlapped the circles.

P2: *"The notes are calming, it is like we are in a Javanese spa, and it feels harmonious. I think note by note is connected, that is why the circles are overlapping."*

Additionally, rectangular shapes arranged in a diagonal line with varying sizes and arrows indicating direction were used by another participant, suggesting a less uniform progression with different intervals. A simple square was used by one participant to represent the *Slendro* scale, indicating a structured form that was different from the circle used for the Diatonic scale. Lastly, a jagged, abstract shape was used by P6 to depict the *Slendro* scale, reflecting an irregular and unique progression.

The key differences between these two scales' visual representations are regarding their structure and visual forms. Diatonic scales are represented with more structured

and orderly shapes, such as rectangles, circles, and smooth lines, indicating a clear and sequential progression. In contrast, *Slendro* scales are depicted with more varied and less structured shapes, such as irregular ovals, jagged lines, and abstract forms, indicating a unique and fluid progression. Furthermore, the visual representations of Diatonic scales are more consistent across participants, showing similar patterns, whereas *Slendro* representations are more diverse, with each participant depicting the scale differently, highlighting its less rigid structure. These visual differences align with the auditory characteristics of the scales, where Diatonic scales are more familiar and structured, while *Slendro* scales are less familiar and more fluid.

Colors

For the Diatonic scale, P1 drew pink vertical bars arranged in a pattern that decreases in height towards the right and continues to increase in height. The intensity of pink varies, with the first bars being darker and then lighter, coming back to darker pink, suggesting an orderly and progressive up and down in pitch. The darker color indicates the lower notes, while the lighter ones are the higher ones. P2 drew a sequence of overlapping colored circles in various shades of orange, red, and yellow, suggesting a smooth and continuous progression with warm colors. P3 displays rectangular blocks in a range of colors arranged in a diagonal line, indicating a structured and sequential progression with colors starting from darker colors (lower notes) to brighter colors (higher notes) and going back to darker colors again, just like the sound

stimuli. Meanwhile, P4 drew a zigzag pattern in rainbow colors, forming an arch shape representing an apparent rise and fall in pitch, using a broad spectrum of colors. Finally, P5 drew a series of colored dots arranged in a straight line, each dot a different color, reflecting a simple, orderly progression with distinct steps. However, the choice of colors was unclear.

In contrast, P1 drew pink vertical bars of varying heights arranged in an irregular pattern for the *Slendro* scale. The order of intensity differs from the Diatonic representation, indicating a less structured and more varied progression. For the *Slendro* scale, P2 represented the stimuli with a sequence of overlapping colored circles in softer shades of yellow, green, and orange, suggesting a smoother, more fluid progression with pastel colors. Meanwhile, P3 depicted the stimuli with rectangular blocks in a range of colors arranged in a diagonal line with varying sizes and arrows indicating direction, suggesting a less uniform progression with a variety of colors. However, the choice of color was pretty straightforward and consistent, and P3 used a darker color for lower notes as well. As for P4, the drawing was a zigzag pattern in rainbow colors forming an arch shape, similar to the Diatonic representation but less regular, reflecting a varied rise and fall in pitch, using a broad spectrum of colors with less rigidity. However, P4 started the line with black (dark color) to indicate the lowest note. Finally, P5 drew colored dots arranged in a straight line; each dot was a different color, similar to the Diatonic representation but with a more varied arrangement, indicating a simple progression

with distinct steps using a variety of colors. In the interviews, P5 also stated that the sound was quite messy and disharmonized.

The Pitch-Visual Elements Relationship in Diatonic and *Slendro* Scales

After the author described the data for each participant, the data was coded in NVivo software, and a Matrix Coding Query was done to make it easier to read the differences and similarities in the visualization.

Figure 5 shows how the Diatonic ascending and descending scales were depicted by the participants.

From Figure 5 it can be seen that Lines and Color were the most agreeable element to represent pitch. The shorter the lines, the lower the notes; the brighter the color, the higher the notes. However, surely it cannot be generalized. There were many other depictions and variations, but similarities were found in the element Line and Color.

The *Slendro* Scale was depicted more randomly. The drawing results did not show an exact pattern of what participants drew. This is why the diagram shows that it has many random orders in shapes, lines, and colors. However, Line was also greatly used to represent the high and low note from the melody scale.

From the results and the visualization diagram presented above, the author created a diagram to show the pattern occurred in both of musical scales visual representation in general. This, of course, is not generalized because there were many variations of visualizations.

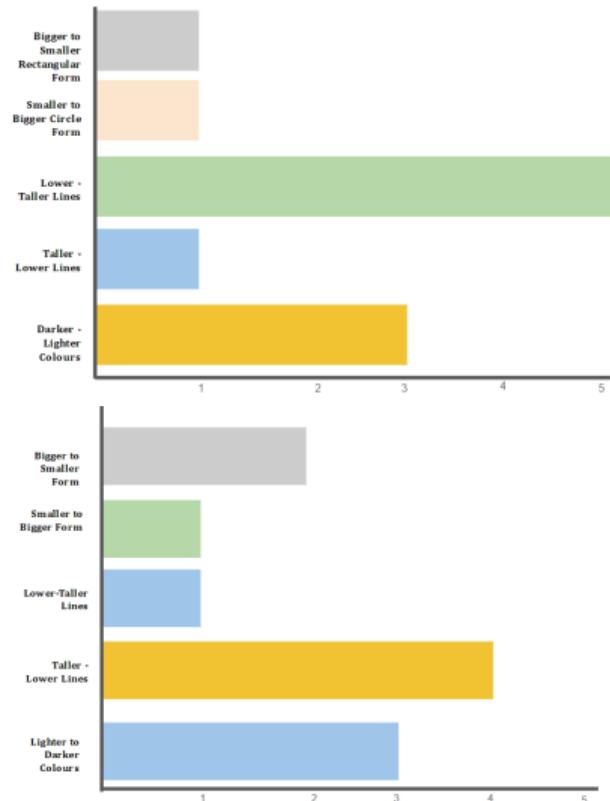


Figure 5. Visualization of Ascending (top) and Descending (bottom) Diatonic Scales

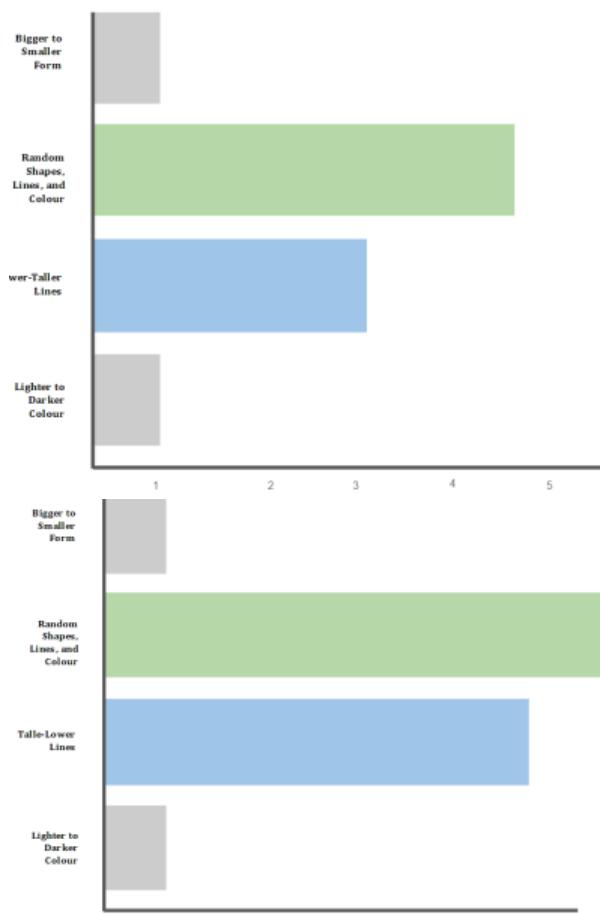


Figure 6. Visualization of Ascending (top) and Descending (bottom) Slendro Scales

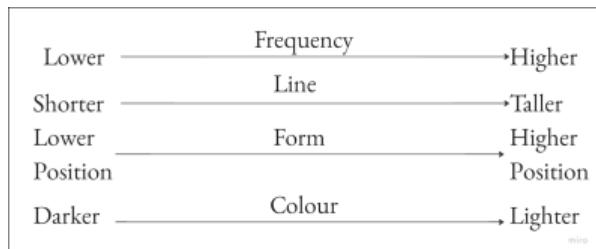


Figure 7. Correlation between Pitch and Visual Elements

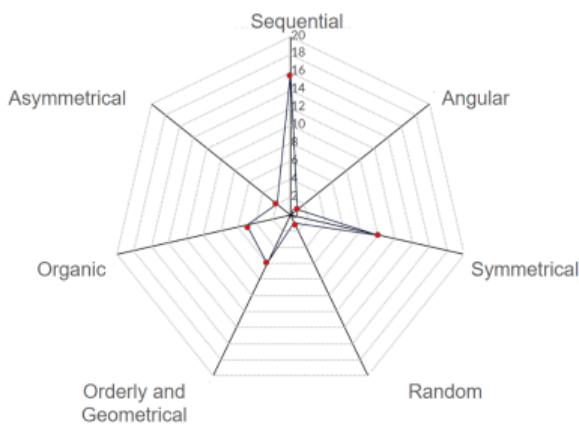


Figure 8. Diatonic Visualization Characteristics

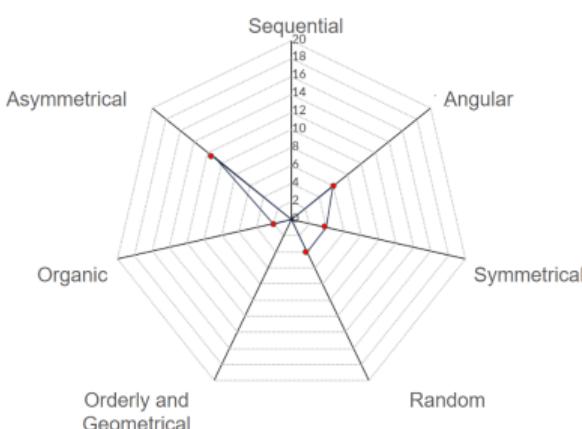


Figure 9. Slendro Visualization Characteristics

Figure 8 shows the characteristics of the participants' visualization of the Diatonic Scale. According to the chart, the visualization is very high in sequential characteristics. The drawings were also symmetrical and in order, which indicates that they are familiar with the sound, and the scale was somewhat linear.

The spider web chart on Figure 9 shows the characteristics of the visualization of

the *Slendro* Scale made by the participants. According to the chart, the visualization is somewhat non-sequential. It has angular and asymmetrical characteristics; as in the interview, the participants also stated that the melody was peculiar but also sounded flexible and 'not strict'.

Cultural Musical Insights and Modern Pitch Visualization

When people turn musical elements like pitch into visual drawings or symbols, it can show us a lot about how different cultures understand and feel about music. In Javanese culture, unique scales like *Slendro* and *Pelog* reflect a musical heritage related to local traditions and practices. These scales are different from Western music scales. The *Slendro* scale, in particular, shows that Javanese music values things like flowing movement and a circular, repeating feeling, not a straight, step-by-step structure (linear) like Western music usually has.

We can also see this difference when we look at how music was written down. In the past, Javanese music (especially *gamelan* music) was not written — it was taught by ear or aurally, with students copying what their teacher played. The music itself is very cyclical (it repeats and flows without a clear "ending" like a Western song often has). Therefore, Javanese musicians still preserve the core of their musical identity when incorporating external influences. *Nut Rante* was one of the proofs that the Javanese adapted some of the forms of Western notation but localized for the use of *gamelan* music performance. This hybridization of musical notation reflects how

local traditions adapt and evolve in response to external stimuli (colonization and Western cultures).

As stated in the background, musically, the Diatonic scale, with its clear and structured progression, is often associated with the formalized and institutionalized nature of Western music education and practice. It is still used nowadays as the 'standard' notation. On the other hand, the *Slendro* scale, with its unique intervals and flexible structure, offers a contrasting perspective on musical organization. From its use in music, it is less rigid because *gamelan* music used to be transmitted orally without any transcription. This flexibility in scales allows greater improvisation and personal expression.

The free-drawing study conducted with young adults provides contemporary insights into how modern individuals perceive and visualize musical elements: pitch, in the form of two types of scales—diatonic and *Slendro*.

The structured, ladder-like drawings for the Diatonic scale symbolize Western musical traditions' explicit, sequential nature, which emphasizes order and sequence, predictability, and a linear progression of notes. This is also reflected in the spider web in Figure 8. Familiarity-wise, the participants are more familiar with this scale (Diatonic), as this scale is used in many modern-day songs (Zidan & Utami, 2023; Achmad, 2020).

Conversely, the varied and flexible visual depictions of the *Slendro* scale resemble the characteristics of Javanese musical tradition. Participants' use of irregular shapes, jagged lines, and diverse colors illustrates *gamelan* music's fluid and cyclical nature, which

contrasts sharply with the rigid structure of Western scales. The visualization of the *Slendro* Scale was very diverse and irregular, indicating that this scale was interpreted in multiple ways.

The participants' musical backgrounds are also an aspect to be considered. P2 and P5, who have musical backgrounds, can easily and clearly depict the musical scale (both Diatonic and *Slendro*) with lines, but it turned out that the other participants who have no musical backgrounds also have the 'sense' to differentiate the two scales.

CONCLUSION

Through this study, we can see the visual representation of pitch in two different musical scales, the Western Diatonic scale and the Javanese *Slendro* scale, based on the drawing of 5 adults. The findings revealed significant differences in how these scales were perceived and visualized by the participants.

Participants depicted the Diatonic scale in a structured and sequential manner, where they used smooth lines, consistent shapes, and orderly color progressions. This suggests a perception of the Diatonic scale as familiar and linear. It also aligns with its structured nature in Western music.

In contrast, the *Slendro* scale was represented with more variability and fluidity. Drawings from the participant showed irregular shapes, jagged lines, and diverse colors. This indicates a perception of the *Slendro* scale as flexible and non-sequential. This variability highlights the unique intervals and cyclical nature of the *Slendro* scale, which

are used in *gamelan* music and are very central to Javanese musical tradition

The study also shows the influence of cultural background on musical perception, with participants familiar with musical notation providing more precise visual representations. However, the ones with no musical background can also depict their perception of the pitch.

The other thing we found in the results is that the visualization can show the familiarity. The participants who are not familiar with the Javanese *Slendro* scale tend to represent it with irregular shapes and lines to show the 'unfamiliarity'.

This unfamiliarity may be influenced by the dominance of Western music in daily life, education, and popular media, even in Indonesia. Many young Indonesians are more exposed to Western musical systems than to traditional scales like *Slendro*. This is a big shift towards globalization.

Understanding this shift is important. As educators and artists, we realize that preserving traditional music in creative fields, such as art, design, and education, may require new approaches that can bridge traditional and modern expressions. Therefore, this study can also be useful for artists and designers. Artists and designers can use these methods based on auditory stimulus to create visual artworks, patterns, or designs that express different moods or cultural meanings.

Relating these findings to the historical development of *Nut Rante* provides another point of view in 'seeing' music in a cultural context. *Nut Rante*'s existence shows how Javanese musicians integrated external

influences while preserving their musical identity, much like how participants in this study visually represented *Slendro* with a distinctive, non-Western fluidity and variability.

However, the study involves only five participants, which may not be sufficient to draw generalizable conclusions. Future studies might increase the sample size and ensure a more diverse group of participants, which could enhance the findings.

ACKNOWLEDGEMENTS

We are grateful to *Museum Sonobudoyo* Yogyakarta for providing the *Nut Rante* data that significantly contributed to this research.

This research was funded by the Indonesian Endowment Fund for Education (LPDP) and BPI (Beasiswa Pendidikan Indonesia). We are grateful for their support, which made this study possible.

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