

Exploring the Relationship Between Self-Reported Brain-Dominance Preferences and Musical Task Performance Among Grade 11–12 Students

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Grade Level

Grade 12

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Subject Area

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ABSTRACT

The popular concept of “left-brain vs. right-brain dominance” remains influential in education and popular psychology despite neuroscientific evidence suggesting that most cognitive processes involve cooperation between both cerebral hemispheres. This study investigated whether self-reported brain-dominance preferences are associated with differences in musical task performance among Grade 11–12 students. A mixed-methods correlational design was used with a convenience sample of 20 students aged 15–17 years. Participants completed a brain-dominance preference questionnaire and two musical tasks: a rhythm reproduction task and a melody creativity task. Quantitative measures included rhythm completion time, rhythm error count, melody creativity scores, confidence prediction accuracy, and task-order effects. Qualitative observations were used to contextualize participant self-identification and behavioral patterns.

Results suggested modest differences between groups. Students categorized as left-dominant generally completed rhythm tasks more quickly and with fewer errors, while right-dominant participants tended to score higher on melody creativity and emotional expression. Balanced participants demonstrated relatively stable performance across both task categories. However, most performance variation

could not be fully explained by self-reported dominance classifications alone. Findings support current neuroscientific perspectives suggesting that musical cognition relies on distributed neural cooperation rather than strict hemispheric specialization.

This study contributes to ongoing discussions surrounding neuromyths in education and highlights the importance of critically evaluating simplified models of cognitive functioning.

Keywords: brain lateralization, musical cognition, hemispheric specialization, neuromyths, rhythm processing, creativity

INTRODUCTION

For several decades, the concept of “left-brain versus right-brain dominance” has remained highly influential in education, psychology, and popular media. The theory proposes that individuals may rely more strongly on one cerebral hemisphere than the other, resulting in predictable cognitive strengths and personality traits. According to this model, the left hemisphere is commonly associated with logical reasoning, analytical processing, sequencing, and language functions, whereas the right hemisphere is associated with creativity, emotional interpretation, spatial awareness, and artistic expression ((G. Gainotti, S. F. Cappa. Why are the right and left hemisphere conceptual representations different? *Behavioral Neurology*. Vol. 2018, pg. 1–12, 2018, <https://doi.org/10.1155/2018/6031346>.)).

The popularity of this framework originated partly from the work of neuroscientist Roger W. Sperry, whose split-brain research examined patients who underwent corpus callosotomy procedures to treat severe epilepsy ((H. Shen. Inner workings: Discovering the split mind. *Proceedings of the National Academy of Sciences*. Vol. 111, no. 51, pg. 18035–18037, 2014, <https://doi.org/10.1073/pnas.1423615112>.)). His findings demonstrated that certain cognitive functions may show hemispheric specialization under specific neurological conditions. However, contemporary neuroscience increasingly suggests that most higher-order cognitive activities involve cooperation between both hemispheres rather than strict lateralized dominance ((S. P. Springer, G. Deutsch. *Left Brain, Right Brain: Perspectives from Cognitive Neuroscience*. 5th ed. New York: W.H. Freeman, 1998.)).

Despite scientific criticism of oversimplified hemispheric theories, the concept of “left-brained” and “right-brained” individuals continues to persist in schools, self-help literature, and commercial educational products. One possible reason for this persistence is that simplified cognitive categories are easier to understand and communicate than complex neuroscientific explanations. Previous studies have also demonstrated that beliefs in neuromyths remain common even among educated populations ((K. Macdonald, L. Germine, A. Anderson, J. Christodoulou, L. M. McGrath. Dispelling the myth: Training in education or neuroscience decreases but does not eliminate beliefs in neuromyths. *Frontiers in Psychology*. Vol. 8, pg. 1314, 2017, <https://doi.org/10.3389/fpsyg.2017.01314>.)).

Although strong claims regarding strict hemispheric dominance are not supported by modern neuroscience, studying self-reported brain-dominance preferences may still provide insight into how individuals perceive their own cognitive strengths and how these perceptions influence task performance. In particular, music cognition offers a useful context for investigating such relationships because musical activities involve multiple interacting cognitive systems, including rhythm perception, auditory sequencing, emotional interpretation, memory, and creativity.

Certain aspects of musical processing have been associated with partial hemispheric specialization. Temporal sequencing and rhythm processing may involve stronger left-hemisphere activation, whereas melody perception and emotional interpretation may involve greater right-hemisphere engagement ((E. R. Kandel, J. H. Schwartz, T. M. Jessell. *Principles of Neural Science*. 5th ed. New York: McGraw-Hill Education, 2013.)). However, musical cognition generally relies on distributed neural networks involving both hemispheres.

This study aimed to explore whether students categorized according to self-reported brain-dominance preferences demonstrate measurable differences in rhythm reproduction and melody creativity tasks. In addition, the study examined metacognitive confidence and task-order effects to determine whether cognitive self-perception may influence behavioral performance.

The study addressed the following research questions:

1. Do self-reported brain-dominance preference groups differ in rhythm task performance?
 2. Do self-reported brain-dominance preference groups differ in melody creativity performance?
 3. How accurately do participants predict their own task performance?
 4. Does task order influence performance outcomes?
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METHODOLOGY

Research Design

This study used a mixed-methods correlational design to investigate whether self-reported brain-dominance preferences are associated with differences in musical task performance. Quantitative analysis was used to compare rhythm and melody task outcomes, while qualitative observations were used to contextualize participant self-identification and behavioral responses.

Participants

The study included 20 students from Grades 11 and 12 between the ages of 15 and 17 years. Participants were recruited through voluntary participation at DPS Monarch International School.

Inclusion Criteria

Participants were required to:

- Be fluent in English
- Have normal or corrected vision and hearing
- Have no reported neurological disorders or traumatic brain injury
- Have no uncorrected sensory impairments

To ensure confidentiality, all participants were assigned numerical identification codes during data collection and analysis.

Ethical Considerations

Written informed consent was obtained from all participants and their parents or guardians before participation. Participation was voluntary, and students were informed that they could withdraw from the study at any stage without penalty. Participant anonymity and confidentiality were maintained throughout the study.

Materials

1. Brain-Dominance Preference Questionnaire

Participants completed a 15-item Herrmann-style preference questionnaire designed to identify self-reported cognitive tendencies commonly associated with left- or right-brain processing ((N. Herrmann. The creative brain. *Journal of Creative Behavior*. Vol. 23, no. 3, pg. 193–207, 1989.))

Responses were categorized using the following criteria:

- 60% or more left-trait responses → Left-dominant
- 60% or more right-trait responses → Right-dominant
- 40–60% mixed responses → Balanced

These classifications represented self-reported preference patterns rather than direct neurological measurements.

2. Rosenberg Self-Esteem Scale (RSES)

The Rosenberg Self-Esteem Scale was used to measure self-confidence and metacognitive confidence regarding anticipated task performance. Higher scores indicated greater self-confidence ((M. Rosenberg. *Conceiving the Self*. New York: Basic Books, 1979.)).

3. Rhythm Reproduction Task

Participants listened to four pre-recorded rhythmic patterns lasting approximately 15–20 seconds each. After listening, students reproduced the rhythms either by tapping or by writing rhythmic notation.

The following measures were recorded:

- Completion time (seconds)
- Number of rhythm mismatches or errors

4. Melody Creativity Task

Participants were provided with an eight-note melody fragment adapted from a simple children's melody. Students were instructed to modify the melody to express a specific emotional theme, such as "angry storm."

Participants could complete the task by:

- Writing musical notation
- Humming or recording the melody
- Verbally describing melodic modifications

Two independent raters evaluated responses using the following rubric:

- Originality: 1–3 points
- Emotional fit: 1–2 points

Total creativity scores ranged from 1 to 5.

Procedure

Pilot Testing

A pilot test involving 3–5 students was conducted to evaluate the clarity of instructions, appropriateness of rhythm recordings, and reliability of the melody scoring rubric. Necessary adjustments were made before formal data collection.

Main Data Collection

1. Participants completed the brain-dominance preference questionnaire.
2. Participants predicted how well they expected to perform on the upcoming tasks.
3. Task order was randomized using a coin flip.
4. Participants completed the rhythm reproduction task.
5. Participants completed the melody creativity task.
6. Melody responses were independently scored by two raters.

Data Analysis

Quantitative data were recorded using Microsoft Excel.

The following analyses were conducted:

- Mean rhythm completion times
- Mean rhythm error counts
- Mean melody creativity scores
- Confidence prediction accuracy comparisons
- Task-order comparisons

Descriptive statistics and visual comparisons were used to identify general performance trends. Due to the relatively small sample size, findings were interpreted cautiously as exploratory rather than definitive.

RESULTS

After data collection and analysis, results were organized according to self-reported brain-dominance preference classifications.

Brain Type	Avg Rhythm Time (sec)	Avg Rhythm Errors	Avg Melody Score (1–5)	Confidence Accuracy (%)	Task-Order Effect
Left-Dominant	28	1.2	2.9	61%	Minimal
Right-Dominant	34	2.1	4.1	55%	Melody-first advantage
Balanced	30	1.5	3.7	68%	Moderate

Key Findings

- Left-dominant participants generally completed rhythm tasks more quickly and with fewer errors.
- Right-dominant participants demonstrated higher melody creativity scores, particularly in originality and emotional expression.
- Balanced participants performed relatively consistently across both task categories.
- Confidence predictions did not strongly align with actual performance outcomes for many participants.
- Task-order effects were observed, particularly among right-dominant participants who performed better when the melody task was completed first.

Although observable differences emerged between groups, the magnitude of these differences remained moderate, and substantial variability existed within each category.

DISCUSSION

The purpose of this study was to investigate whether self-reported brain-dominance preferences are associated with measurable differences in musical task performance among Grade 11–12 students.

Results provided limited support for traditional hemispheric specialization theories. Participants categorized as left-dominant generally performed better on rhythm reproduction tasks involving sequencing, timing, and structured auditory processing. In contrast, participants categorized as right-dominant tended to achieve higher melody creativity scores, particularly in originality and emotional expression.

These findings align partially with conventional descriptions of hemispheric specialization. However, the results should be interpreted cautiously because modern neuroscience suggests that musical cognition relies on distributed neural cooperation rather than isolated hemispheric functioning.³

Balanced participants demonstrated relatively stable performance across both tasks, which may suggest that flexible cognitive processing contributes to broader task adaptability.

An additional finding involved task-order effects. Some right-dominant participants demonstrated stronger performance when the melody creativity task preceded the rhythm reproduction task. This pattern may indicate that beginning with a creative activity influences subsequent cognitive engagement and expressive processing.

The study also explored metacognitive confidence. Many participants inaccurately predicted their own task performance, suggesting that subjective beliefs regarding cognitive strengths do not always correspond closely with measurable outcomes.

Importantly, the findings do not support strict neurological interpretations of “left-brained” or “right-brained” individuals. Instead, the results suggest that self-perceived cognitive preferences may influence behavioral tendencies without reflecting absolute hemispheric dominance.

Limitations

Several limitations should be considered when interpreting the findings.

First, the sample size was relatively small ($N = 20$), limiting statistical power and reducing the generalizability of the results. Second, brain-dominance classifications were based on self-report questionnaires rather than neurological measurements such as neuroimaging or electrophysiological methods. Third, creativity scoring may contain subjective elements despite the use of independent raters.

Future studies could improve upon these limitations by including larger participant samples, more advanced statistical analysis, and neuroscientific measurement techniques.

CONCLUSION

This study explored the relationship between self-reported brain-dominance preferences and musical task performance among Grade 11–12 students.

The findings suggest that:

- Left-dominant participants tended to perform better on rhythm-based tasks involving sequencing and timing.
- Right-dominant participants generally achieved higher melody creativity scores.
- Balanced participants demonstrated relatively stable performance across both task categories.
- Confidence predictions were not consistently aligned with actual performance.
- Task-order effects may influence cognitive and creative task performance.

Overall, the study provides limited support for traditional hemispheric specialization theories while reinforcing modern neuroscientific perspectives emphasizing distributed cognitive processing across both hemispheres.

Although simplified “left-brain/right-brain” frameworks remain influential in education and popular culture, the findings suggest that musical cognition involves complex interactions among multiple cognitive systems rather than strict hemispheric dominance.

ACKNOWLEDGMENTS

The authors would like to thank Ms. Neethu Balan and Ms. Reema Raheja for their guidance and support throughout the research process. The authors also thank the participating students and DPS Monarch International School for facilitating the study.

REFERENCES

1. G. Gainotti, S. F. Cappa. Why are the right and left hemisphere conceptual representations different? *Behavioral Neurology*. Vol. 2018, pg. 1–12, 2018, <https://doi.org/10.1155/2018/6031346>.
2. H. Shen. Inner workings: Discovering the split mind. *Proceedings of the National Academy of Sciences*. Vol. 111, no. 51, pg. 18035–18037, 2014, <https://doi.org/10.1073/pnas.1423615112>.
3. S. P. Springer, G. Deutsch. *Left Brain, Right Brain: Perspectives from Cognitive Neuroscience*. 5th ed. New York: W.H. Freeman, 1998.
4. K. Macdonald, L. Germine, A. Anderson, J. Christodoulou, L. M. McGrath. Dispelling the myth: Training in education or neuroscience decreases but does not eliminate beliefs in neuromyths. *Frontiers in Psychology*. Vol. 8, pg. 1314, 2017, <https://doi.org/10.3389/fpsyg.2017.01314>.
5. E. R. Kandel, J. H. Schwartz, T. M. Jessell. *Principles of Neural Science*. 5th ed. New York: McGraw-Hill Education, 2013.
6. N. Herrmann. The creative brain. *Journal of Creative Behavior*. Vol. 23, no. 3, pg. 193–207, 1989.

7. D. A. Sousa. *How the Brain Learns*. 5th ed. Thousand Oaks, California: Corwin Press, 2016.
8. M. Rosenberg. *Conceiving the Self*. New York: Basic Books, 1979.