



Beginner Learners' Perceptions of Gesture-Based Total Physical Response in Mandarin Tone Learning

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Abstract. The purpose of this study was to examine beginner learners' perceptions of gesture-based Total Physical Response (TPR) activities for learning Mandarin tones and to describe learners' tone production based on selected acoustic recordings. The method used was a descriptive mixed-methods design. Data collection methods include documentation, observation, and questionnaires. The documentation consists of recordings of numbers 1-10 to represent tones 1-4. These recordings are then analyzed using the Praat application. Observations during the one-semester learning process include noting hand gestures, both when playing games and when practicing tone pronunciation. Furthermore, data were collected by distributing questionnaires via Google Forms. The measurement scale uses a 1-5 Likert scale, ranging from strongly disagree to agree strongly. The sample used was a saturated sample of 55 students. The findings indicate that learners perceived gesture-based TPR activities as helpful for learning and remembering Mandarin tones. The TPR method, in the form of whispering movements, tone relay, and even learning with hand gestures, was very helpful for learners' memory and made them very happy to participate in the learning process. For future researchers, it is hoped that they will find additional TPR methods to help non-tonal learners learn tonal languages.

Keywords: Beginner Learners, Hand Gestures, Total Physical Response, Tone

1 Introduction

Mandarin is a tonal language that relies heavily on pitch accuracy to convey meaning. Differences in pitch within a single syllable can produce completely different meanings, making pitch accuracy a fundamental aspect of Mandarin speaking skills. Tone/pitch patterns distinguish lexical meaning. There are four tones in Mandarin: Tone 1: represented by a straight line (55), Tone 2: represented by an ascending line (35), Tone 3: represented by a curved line (214), and Tone 4: represented by a descending line (51) (Hao, 2012). When elementary-level college learners of Mandarin encounter tones, they will experience difficulties. However, for beginning learners, especially those from a non-tonal language background, such as Indonesian, mastering Mandarin tones

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is a significant challenge (Dandan et al., 2021). Beginner-level learners particularly experience this difficulty. Based on observations, they struggle to distinguish pitch and even to consistently produce variations in pitch (Bryfonski & Ma, 2020). As a result, pitch pronunciation errors persist even after students have mastered vocabulary and sentence structure. One learning approach that is considered effective in overcoming this problem is Total Physical Response (TPR).

Total Physical Response (TPR) combines target-language input with semantically corresponding physical gestures, allowing learners to associate language input with physical actions that may support understanding and memorization (Liu et al., 2024). Developed by James Asher, TPR encourages learners to listen to language input and respond through meaningful physical actions. The approach is consistent with behaviourist principles, in which learning involves associations between stimuli and responses (Asher, 1981). In classroom practice, teachers provide verbal commands while learners demonstrate their understanding through physical movements. This physical component is particularly relevant to gesture-based Mandarin tone learning because different hand movements can visually represent different pitch contours. The use of physical movement can also be interpreted from the perspective of embodied cognition, which emphasizes the close relationship between bodily activity and cognitive processes during learning (Castro-Alonso et al., 2024). Therefore, gesture-based TPR may provide learners with an additional physical representation of Mandarin tone patterns. TPR provides learners with opportunities to receive auditory input before producing a physical response. Through repeated listening and physical responses, learners can associate spoken language with meaningful movements. In Mandarin tone learning, this process may be particularly useful because learners need to associate auditory pitch patterns with distinct tonal categories.

Previous TPR studies have primarily focused on vocabulary mastery, listening skills, motivation to learn, classroom participation, and instructional materials. Although these studies demonstrate the potential of TPR as a language-learning approach, comparatively little attention has been paid to its application to learning Mandarin tones. In particular, few studies have examined systematic use of hand gestures to represent Mandarin pitch contours and learners' perceptions of such activities.

This gap is particularly relevant for beginner learners from non-tonal language backgrounds, who may experience difficulty associating auditory pitch patterns with Mandarin tonal categories. Gesture-based TPR provides a potentially meaningful way to connect auditory input with physical and visual representations. However, empirical evidence regarding how learners perceive the use of hand gestures, movement-based games, and other physical activities in Mandarin tone learning remains limited.

Therefore, this study aims to examine beginner learners' perceptions of gesture-based Total Physical Response (TPR) activities for learning Mandarin tones. The study focuses on four aspects: (1) learners' perceptions of teacher movements and hand gestures, (2) learners' perceptions of game-based TPR activities, (3) hand gestures as support for tone recognition and memory, and (4) learner engagement and perceived support for tone pronunciation. In addition, selected learners' tone productions are examined descriptively through acoustic analysis in Praat to provide supporting evidence of Mandarin tone production patterns.

2 Methodology

2.1 Research Design

This study employed a descriptive mixed-methods design to examine beginner learners' perceptions of gesture-based Total Physical Response (TPR) activities for learning Mandarin tones.

2.2 Participants

The participants were 55 beginner-level Mandarin learners from two elementary Mandarin classes. The participants had the same level of Mandarin proficiency and had received Mandarin instruction for the same period. The study used a total population sampling technique, in which all 55 learners from the two classes participated in the questionnaire and learning activities. The study was conducted during the September 2025–February 2026 semester.

For the supporting acoustic analysis, three participants were purposively selected based on their highest pronunciation scores for the Mandarin numbers one to ten. The selection was based on the pronunciation assessment conducted during the TPR learning activities. The pronunciation scores were determined using predefined criteria for tone accuracy, particularly the correspondence between learners' produced tones and the expected Mandarin tone patterns. The three selected learners were used to provide descriptive acoustic information regarding Mandarin tone production. Their recordings were not intended to represent the entire group of 55 participants.

2.3 Data Collection Procedure

The data collection was conducted during the September 2025–February 2026 semester. The activities were conducted in 14 sessions, with each session lasting approximately 150 minutes. The learning activities were conducted by the researcher, who also served as the Mandarin teacher.

2.4 Questionnaire

A questionnaire comprising eight statements was developed to examine learners' perceptions of gesture-based TPR for learning Mandarin tones. The questionnaire addressed four main aspects: (1) learners' perceptions of teacher movements and hand gestures, (2) perceptions of game-based TPR activities, (3) hand gestures as support for tone recognition and memory, and (4) learner engagement and perceived support for tone pronunciation.

The questionnaire was distributed through Google Forms using a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. The questionnaire items were as follows.

- 1) My teacher uses body language to explain Mandarin tones.
- 2) I follow the hand movements when pronouncing Mandarin tones.
- 3) I can guess the tones using the whispering gesture game.
- 4) I can guess the tones using the tone relay game.

- 5) I can recognize Mandarin tones through hand gestures.
- 6) I find it easier to remember tones with the help of gestures.
- 7) I actively and enthusiastically participate in the gesture game.
- 8) The physical movement method helps me pronounce the tones correctly.

2.5 Classroom Observation

Classroom observations were conducted throughout the learning process to document learners’ responses to gesture-based TPR activities. The observations focused on learners’ responses to teacher commands and movements, their ability to follow and reproduce hand gestures, and their participation in tone-practice and game-based activities. Particular attention was given to the use of physical gestures to represent Mandarin tone patterns and learners’ responses when identifying or producing the tones. The observation data were used as supporting qualitative evidence for interpreting the questionnaire findings. The observations did not serve as a measure of TPR’s causal effectiveness.

2.6 Voice Recording and Praat Analysis

Voice recordings were collected during Mandarin pronunciation activities involving the numbers one to ten. The recordings were used to examine the production of Mandarin tones represented in the target words. Three participants with the highest pronunciation scores were selected for further acoustic analysis. The selected recordings were analysed using Praat to examine the learners’ pitch contours. The recordings were made using a phone. The recordings were saved in MP3 format. In Praat, pitch analysis was conducted over the range 65-800 Hz. The analysis focused on the fundamental frequency (F0) patterns associated with the Mandarin tones. The expected tone patterns were compared with the pitch contours observed in the recordings. The Praat analysis was intended to provide descriptive acoustic evidence of tone production among the selected high-performing learners rather than to establish the effectiveness of the TPR method.

3 Result and Discussion

Tone pronunciation can be improved by using TPR through hand gestures. This hand movement is shown in Figure 1. Perceptions of Gesture-Based Total Physical Response in Mandarin tone learning are divided into four parts: Learners’ Perceptions of Teacher Movements and Hand Gestures; Learners’ Perceptions of Game-Based TPR Activities; Hand Gestures as Support for Tone Recognition and Memory; and Learner Engagement and Perceived Support for Tone Pronunciation.



Figure 1. Hand gestures for notes 1-4

3.1 Learners' Perceptions of Teacher Movements and Hand Gestures

TPR provides learners with opportunities to respond physically to teacher commands and movements (Afrianti & Rustipa, 2024b). Figure 2 shows that 44 learners (80.0%) strongly agreed, 10 learners (18.2%) agreed, and 1 learner (1.8%) selected the lower-agreement category regarding the use of teacher body movements to explain Mandarin tones. Thus, 98.2% of learners responded positively. This finding indicates a strong positive perception of the use of teacher movements in explaining Mandarin tones. Figure 3 shows a similarly positive response to following hand movements when pronouncing Mandarin tones, with 40 learners (72.7%) strongly agreeing, 12 (21.8%) agreeing, and 3 (5.5%) selecting the moderate-agreement category. These findings suggest that learners generally perceived physical movement and hand gestures as useful supports for following teacher instructions during tone practice. This positive perception can be interpreted in relation to embodied cognition, which emphasizes the role of bodily actions in learning and memory. Consistent with this perspective, Kuo et al. (2014) reported that an embodiment-based TPR approach resulted in better learning retention than conventional TPR. Figure 4 further shows that learners reported being able to represent Mandarin tones using hand gestures, as instructed by the teacher. Overall, the findings indicate a strong positive tendency in learners' perceptions of movement- and gesture-based TPR activities.

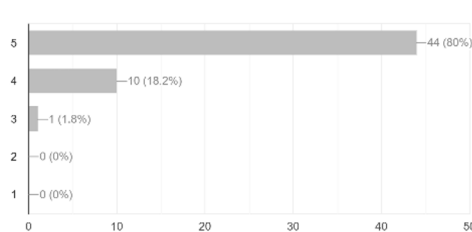


Figure 2. My lecturer uses body movements to explain Mandarin tones

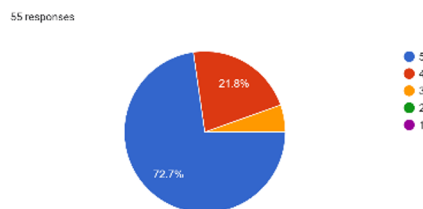


Figure 3. I follow the hand movements when pronouncing Mandarin tones

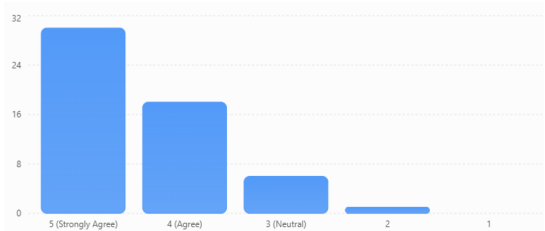


Figure 4. I can show the tone by using hand gestures according to the words instructed by the teacher

3.2 Learners’ Perceptions of Game-Based TPR Activities

TPR can be implemented through various classroom activities, including games, movement, simulation, music, and mimicry (Chuah et al., 2022). In this study, game-based TPR activities included the whispering motion game and the tone relay game. These activities were designed to engage learners in listening, identifying, and physically responding to Mandarin tones. These game-based teaching methods can be seen in Figure 5-6.

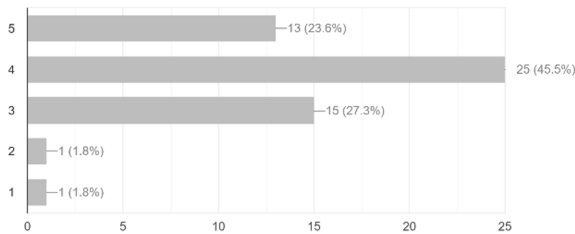


Figure 5. I can guess the tune through the whispering motion game

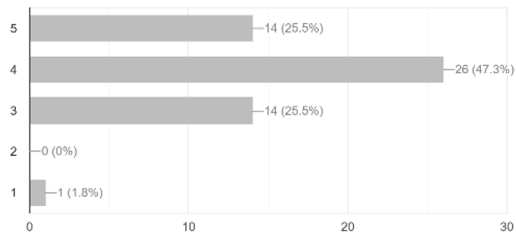


Figure 6. I can guess the notes through the note relay game

Figure 6 indicates a strongly positive perception of the whispering motion game. Of the 55 learners, 25 (45.5%) agreed, 13 (23.6%) strongly agreed, 15 (27.3%) selected the moderate-agreement category, and only 2 (3.6%) disagreed. Overall, 96.4% of learners gave a positive or moderate-positive response to the activity. Similarly, Figure 7 shows that 40 learners (72.7%) agreed or strongly agreed that they could identify the tones through the tone relay game, while 14 (25.5%) selected the moderate-agreement

category and only 1 (1.8%) strongly disagreed. These findings indicate a positive perception of TPR-based games, particularly their ability to support learners' engagement in Mandarin tone recognition activities. This positive perception is consistent with Ruiz et al. (2024), who reported that students experienced game-based activities as relaxed, enjoyable, and cooperative, suggesting that games can contribute to a positive classroom learning environment.

The teaching method involves giving words in Mandarin, then having the learner demonstrate them. As indicated in Figures 6 and 7, the whispering motion game and tone relay game require learners to listen to the teacher's spoken words and identify the corresponding Mandarin tones. In these activities, the teacher presented Mandarin words representing different tonal patterns, and learners were required to identify the corresponding tone through a physical gesture. For example, learners were presented with words such as 坐 and 左, 马 and 麻, 是 and 十, and 请 and 青, which share similar segmental sounds but differ in tone. The learners indicated their answers using predetermined hand gestures.

3.3 Hand Gestures as Support for Tone Recognition and Memory

When teachers explain new words or phrases, they sometimes use hand gestures to convey the tone used in the new word or phrase. Classroom observations also indicated that learners were able to associate hand gestures with the corresponding Mandarin tones and record them during learning activities. This observation is consistent with the questionnaire results in Figure 7, in which 39 learners (70.9%) strongly agreed, 13 (23.6%) agreed, and 3 (5.5%) selected the moderate-agreement category that they could recognize Mandarin tones through hand gestures. Thus, 94.5% of learners expressed agreement or strong agreement with the statement.

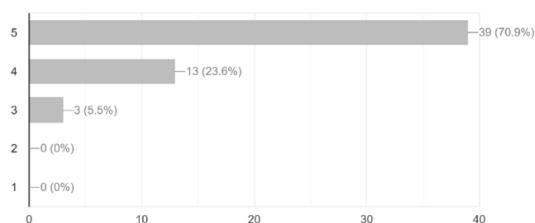


Figure 7. I can recognize Mandarin tones through hand gestures

Classroom observations indicated that some learners had difficulty distinguishing Tone 2 from Tone 3. Learners also encountered difficulties with changes in contextual tone. For example, when two-thirds tones occur consecutively, the first third tone is generally realized as a rising tone in connected speech. Such tonal variation may add difficulty for beginner learners. In Mandarin, when Tone 3 meets Tone 3, the pronunciation of the first word must use Tone 2 instead of Tone 3. This tonal change also confuses when learning tones. However, using the TPR method with hand gestures will greatly help learners remember these tones, especially for elementary-level learners whose native language is not tonal. Against this background, the high level of agreement in Figure 8 suggests that learners perceived hand gestures as a useful aid for remembering

Mandarin tone patterns. Figure 8 shows that 46 students strongly agree, 7 students agree, and 2 students quite agree that it is easier to remember the tune with the help of hand gestures. This finding is consistent with He-Zhang et al. (2025), who reported that movement-based learning could support immediate recall in translation and recognition tasks.

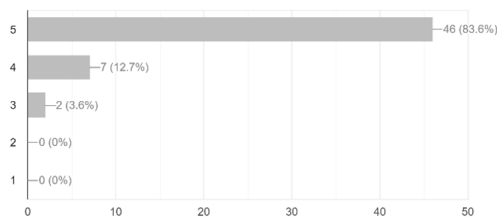


Figure 8. I find it easier to remember the tone with the help of gestures

3.4 Learner Engagement and Perceived Support for Tone Pronunciation

The game model will greatly help students become more enthusiastic about learning. The use of games was also associated with positive learner engagement. Figure 9 shows that 27 learners (49.1%) strongly agreed and 23 (41.8%) agreed that they were active and enthusiastic during the tone-guessing game, while only 1 learner (1.8%) strongly disagreed. Thus, 90.9% of learners expressed agreement or strong agreement, indicating a strong positive perception of their engagement during the game-based TPR activity.

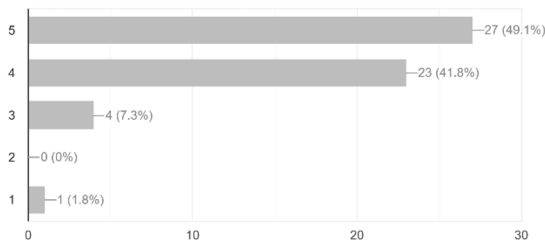


Figure 9. I am active and enthusiastic in playing the game of guessing the tune

Figure 10 shows that learners generally perceived physical movement as supportive of Mandarin tone pronunciation. Among the 55 learners, 38 (69.1%) strongly agreed, 14 (25.5%) agreed, 2 (3.6%) selected the moderate-agreement category, and 1 (1.8%) strongly disagreed. Overall, 94.5% of learners agreed or strongly agreed that physical movement helped them pronounce Mandarin tones. This finding reflects learners’ perceptions rather than a direct measurement of improvement in pronunciation accuracy. This perception is consistent with Gillette (2017), who found that the use of hand gestures in Mandarin tone instruction was associated with improved lexical tone production accuracy, including pitch range and pitch contour. The realization of tone is

a process in which a specific pitch is associated with lexical information (Song, 2022). Mandarin has four tones: Yinping, Yangping, Shangsheng, and Qusheng, which are generally referred to as tones 1, 2, 3, and 4. These four tones have different pitches. The pitches of each tone when standing alone are 55, 35, 214, and 51.

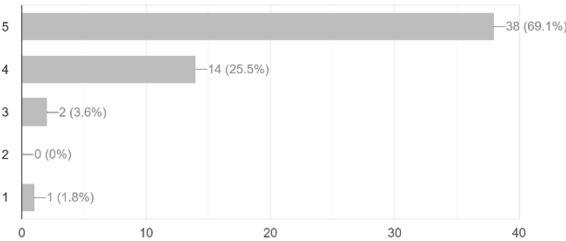


Figure 10. The physical movement method helps me pronounce the notes correctly

3.5 Supporting Acoustic Analysis of Selected Learners

The voice recordings of the three highest-scoring participants were subsequently analyzed using Praat. The analysis examined the fundamental frequency (F0) contours of their Mandarin number productions from one to ten. The purpose of this analysis was to describe the pitch patterns produced by learners with the highest pronunciation scores and to provide supporting acoustic evidence for the questionnaire and observation findings. Figures 11-13 show the pronunciation of tones 1-4 by three learners selected based on their scores on the pronunciation test for numbers 1-10. The figure below shows a basic-level learner pronouncing the difference in pronunciation of the numbers 1 to 10 with and without hand gestures. Pronunciation of tones for numbers 1-10 with hand gestures is more accurate than without the aid of hand gestures. This suggests that applying the TPR method through hand gestures can enhance learners' accuracy in pronouncing tones 1-4 when reciting numbers 1-10.

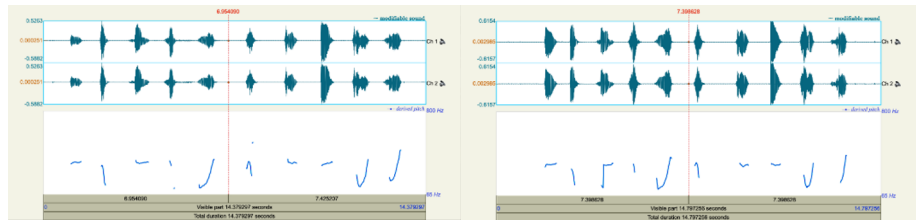


Figure 11. First learner (left with hand gesture; right without hand gesture)

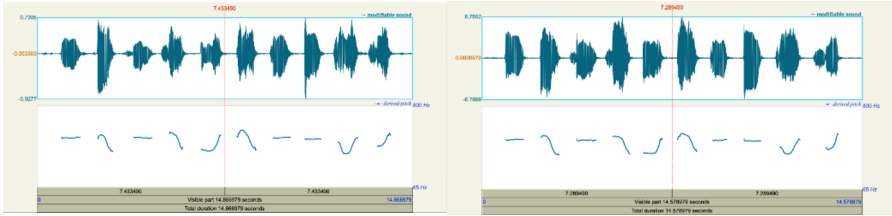


Figure 12. Second learner (left with hand gesture; right without hand gesture)

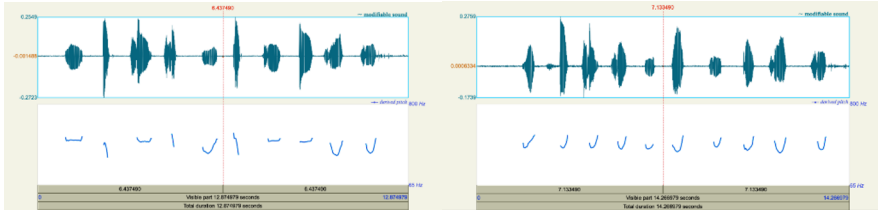


Figure 13. Third learner (left with hand gesture; right without hand gesture)

4 Conclusion

The findings indicate that beginner learners responded positively to the implementation of gesture-based TPR activities for learning Mandarin tones. The questionnaire results particularly suggest positive perceptions of hand gestures, whispering-motion games, and tone-relay activities as supports for recognizing, remembering, and practicing Mandarin tones. The selected Praat recordings provide illustrative acoustic evidence of learners' tone production; however, these recordings cannot be used to establish the effectiveness of TPR for the entire sample. Therefore, the findings should be interpreted primarily in terms of learners' perceptions and observed learning responses rather than causal effects.

This study is limited by the absence of a pre-test, post-test, and control group and by the acoustic analysis being conducted on only three selected participants. Future studies should employ a quasi-experimental design with pre- and post-tests, a comparison group, and acoustic analysis involving a larger number of participants to examine changes in Mandarin tone accuracy more objectively.

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