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The Impact of *Tabuh & pathet* Gamelan Practice on Cognitive Aging in Older Adults

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ABSTRACT

Tabuh & pathet are among the most fundamental techniques that a *gamelan* player must master in order to play the instrument fluently. *Tabuh* refers to striking a *gamelan* key with a mallet using the dominant hand, while *pathet* refers to dampening the resonance of the key with the non-dominant hand to prevent it from sustaining too long. Executing proper *tabuh & pathet* within a melodic pattern (*gendhing*) demands sustained concentration, rapid cognitive processing, and the ability to recall which key to dampen at the appropriate moment. This cognitively demanding practice holds potential applications in music therapy, particularly for older adults who may benefit from structured activities that stimulate attentional control, bilateral motor coordination, and working memory. The purpose of this study was to evaluate the impact of practicing *tabuh & pathet* on the cognitive performance of older adults. Seven older adults without cognitive impairment participated in weekly introductory *gamelan* practice sessions conducted over a two-month period, accompanied by peer partners and a music therapist. Participants practiced the *tabuh & pathet* technique while learning melodic patterns (*gendhing*) aurally, without the use of visual aids or written notation. Cognitive performance was assessed using the Mini-Mental State Examination (MMSE) administered before and after the intervention. Following the two-month intervention, all participants demonstrated improvement in their MMSE post-test scores, suggesting that structured *gamelan* practice may serve as an effective form of cognitive stimulation for older adults.

Keywords: *Gamelan; Cognitive; Aging; Therapy*

INTRODUCTION

Gamelan is a vital part of Indonesia's musical heritage and has long been recognized internationally. Across Indonesia, numerous types of *gamelan* ensembles exist, with the more widely known traditions originating from West Java (*gamelan Sunda*), Central Java, Yogyakarta, and Bali. Each region has its own tuning systems, repertoire, performance practices, and cultural contexts that shape how the music is performed and transmitted across generations. Despite these regional differences, *gamelan* ensembles share several fundamental playing techniques and musical principles that are widely recognized among practitioners. Most *gamelan* instruments are played using the *tabuh & pathet* techniques. In this approach, the dominant hand strikes the keys with a mallet (*panggul*), while the non-dominant hand dampens the key using the thumb and index finger. Certain instruments, such as the *gender*, require two mallets, in which case the keys are dampened using the palms. While these techniques may appear straightforward at first, traditional *gamelan* training introduces an additional layer of difficulty, as pieces in several traditions are primarily transmitted through aural tradition. Before written notation or visual cues were introduced, players learned pieces entirely through listening and memorization. This oral transmission system requires learners to develop strong auditory discrimination, memory, and the ability to respond musically within an ensemble setting. Consequently, while executing proper *tabuh & pathet* technique, players

must simultaneously recall the melody and rhythmic pattern of the music. Remembering which key to strike, which to dampen, and when to do so throughout a complete piece can be cognitively demanding. The simultaneous coordination of auditory memory, motor execution, and sustained attention requires continuous cognitive engagement (Jaquess et al., 2020; Song, 2019). These characteristics suggest that *gamelan* playing may have meaningful applications in music therapy. The cognitive and motor coordination required in *tabuh & pathet* techniques may provide structured mental stimulation that is particularly relevant for therapeutic contexts. In addition, the communal nature of *gamelan* performance encourages social interaction and collaborative listening, which may further enhance its therapeutic potential.

Several studies have explored the cognitive benefits of *gamelan*. Hasnah and Nuryanti (2024) reported improved cognitive performance among 20 older adults following participation in *gamelan* practice sessions. Another study involving 25 participants found that combining Balinese *gamelan* music with sensorimotor rhythm intervention improved motor synchronization, sustained focus, emotional engagement, and language processing in children with autism spectrum disorder (Antara et al., 2024). Wijayanto (2025) concluded that active *gamelan* practice may enhance self-confidence, teamwork, discipline, and concentration. These findings suggest that *gamelan*-based activities may offer benefits extending beyond musical skill development and can positively influence cognitive, emotional, and social domains. A *gamelan* training program in the United States emphasizes cultivating students' capacity to think and respond as Javanese musicians do—specifically in how they listen to other players, coordinate their playing with the ensemble, and memorize melodic material through aural tradition. Such training approaches highlight the centrality of collective listening and musical responsiveness in *gamelan* performance practice. However, most existing studies have focused on the effects of listening to *gamelan* recordings rather than active playing (Yusli & Rachma, 2019; Wulan & Apriliyasari, 2020; Sari & Anggarawati, 2022; Nugroho et al., 2022). Listening-based interventions tend to examine the relaxing or emotional effects of *gamelan* music, but may not capture the full range of cognitive engagement that occurs during active participation. This leaves a gap in understanding how the act of playing *gamelan*—which involves memory, motor coordination, and sustained attention (Brashier, 2026)—may influence cognitive performance. Given the distinctive demands of *gamelan* practice, this is an area that warrants considerably greater investigation. In particular, limited attention has been given to how specific *gamelan* playing techniques, such as the coordinated use of *tabuh & pathet*, may contribute to cognitive engagement and stimulation. Addressing this gap is essential for understanding how culturally rooted musical practices can be translated into meaningful therapeutic interventions, and for identifying specific elements of *gamelan* playing that can be adapted into structured therapeutic activities.

This topic is particularly relevant in the context of Indonesia's changing demographics. As the fourth most populous country in the world, Indonesia is experiencing a demographic dividend, with its working-age population growing faster than its dependent population (those under 15 and over 65 years of age). In 2019, 172.7 million people were in the productive-age group (15–59 years), while adults aged 60 and above accounted for 10% (26.8 million) of the total population (BPS-Statistics Indonesia, 2019). Although the working-age group remains large, the older adult population is steadily increasing. This demographic shift indicates that the number of individuals entering older adulthood will continue to grow in the coming

decades. Older adults constituted 5% of the population in 2010; by 2035, this proportion is projected to reach 11%. Concurrently, Indonesia is transitioning from high birth and death rates to low birth and death rates, and life expectancy continues to rise—from 72.51 years in 2015 to a projected 75.47 years in 2045 (BPS-Statistics Indonesia, 2018). Increased longevity introduces new challenges related to maintaining quality of life, functional independence, and cognitive functioning among older adults. These demographic changes underscore the need for programs and interventions that support healthy aging. As the proportion of older adults grows, accessible and culturally appropriate approaches that promote cognitive health will become increasingly important for communities and healthcare systems across Indonesia. Interventions that incorporate familiar cultural practices may also encourage greater participation among older adults, as they resonate with participants' lived experiences and cultural identity.

It is well established that aging affects cognitive functioning in various ways. Cognitive aging is a normative process that encompasses both gains and losses; however, declines in episodic memory and decision-making are common (Blazer, 2018). Older adults frequently experience slower information processing, reduced working memory capacity, and declines in executive function (Murman, 2015). Emotional changes and difficulties in performing daily activities may also occur (Zainurridha et al., 2021), potentially affecting an individual's independence, social engagement, and overall well-being. While cognitive decline is a typical feature of older adulthood, the rate and severity vary considerably among individuals (Uniyal, 2024). This variability underscores the importance of providing accessible and culturally meaningful interventions that support cognitive health as people age. Music-based activities have been widely recognized as a promising approach for supporting cognitive engagement, particularly when they involve active participation, memory recall, and coordinated motor activity. Active music-making requires individuals to process auditory information, coordinate movements, and sustain attention, thereby potentially stimulating multiple cognitive domains simultaneously. As a result, music-based interventions have been increasingly investigated as supportive strategies for maintaining cognitive functioning in older populations.

Given Indonesia's demographic trajectory and the cognitive demands inherent in *gamelan* playing, there is a compelling opportunity to examine *gamelan* as a potential intervention within music therapy. The combination of memory, motor coordination, attentive listening, and cultural identity involved in *gamelan* playing makes it especially relevant for supporting cognitive health in older adults. The ensemble-based nature of *gamelan* performance also fosters cooperation and shared musical responsibility, which may strengthen social engagement among participants. Further research is needed to understand this potential and to develop approaches that are compatible with both clinical requirements and Indonesia's musical traditions. Therefore, the purpose of this study is to evaluate the impact of practicing *tabuh & pathet* techniques in *gamelan* playing on the cognitive performance of older adults. By focusing on the active process of learning and practicing these techniques, this study seeks to explore how culturally grounded musical practices can contribute to cognitive stimulation among older adults. The findings are expected to provide preliminary evidence for the potential benefits of *gamelan*-based activities in music therapy settings and to inform future research and program development aimed at supporting healthy aging in Indonesia. In the long term, such research may also contribute to the development of culturally responsive therapeutic practices that integrate traditional Indonesian music into health and community programs.

METHOD

Ten older adults were initially referred for the *gamelan* practice sessions; however, only seven ultimately participated. One individual was excluded due to observable severe cognitive difficulties, one withdrew owing to arm pain, and one was unable to attend due to a scheduling conflict. Participants were recruited through community referrals and informal outreach to older adults who expressed interest in a music-based activity. Inclusion criteria were: (1) age 60 years or older; (2) absence of a diagnosed severe cognitive impairment that would preclude participation in structured musical activities; (3) sufficient upper-extremity motor function to strike a *gamelan* key with a mallet; and (4) willingness to attend regular practice sessions for the duration of the study. Individuals were excluded if they presented with severe cognitive impairment that impeded the ability to follow instructions, had acute physical pain or mobility limitations affecting arm movement, or were unable to commit to the scheduled sessions.

All seven participants completed the Mini-Mental State Examination (MMSE) as a pre-test prior to commencing the practice sessions. The final sample consisted of seven participants aged 60 years and above who were able to follow basic instructions and engage in the practice sessions. Participants comprised a small, community-based sample of older adults with no prior formal experience playing *gamelan* instruments. None of the participants were professional musicians, and their prior exposure to *gamelan* was limited to informal listening or general cultural familiarity.

Data were collected through pre- and post-test administration of the MMSE, as well as through analysis of session recording transcripts. The MMSE was used as a brief screening instrument to assess global cognitive functioning. It evaluates several cognitive domains, including orientation, attention, short-term memory, language ability, and basic visuospatial skills. In the context of this study, the MMSE was administered to identify potential changes in cognitive performance before and after participation in the *gamelan* practice sessions. Session transcripts were analyzed to examine participants' interactions with peers and the therapist, as well as observable changes in affect and overall engagement. Each pre-test and post-test was administered twice on separate days by an assessor other than the therapist, in order to ensure measurement stability and objectivity. Final scores for both the pre-test and post-test were calculated by averaging the two administrations, thereby minimizing day-to-day fluctuations in cognitive performance and providing a more stable estimate of each participant's score. This study received ethical approval from the Research Ethics Board of Universitas Pelita Harapan, Indonesia, in January 2023.

Following the pre-test, participants were paired into dyads. Pairing was intended to encourage social interaction and cooperative listening during practice sessions. Working in dyads also allowed participants to support one another during the learning process, which was expected to enhance motivation and engagement. All dyads participated in two practice sessions per week over a two-month period, with each session lasting approximately 30 minutes, yielding approximately one hour of structured *gamelan* practice per participant per week. Over the course of the two-month intervention, participants completed approximately 16 practice sessions in total. Sessions were facilitated by a therapist who demonstrated techniques, guided participants through exercises, and observed their engagement and interaction throughout.

The intervention was structured in two stages. In Stage 1, participants learned the fundamental *tabuh & pathet* technique through a series of progressive routines and practiced a simple melodic pattern (*gendhing*). All activities in this stage were conducted through aural transmission, without visual cues or written notation, in order to replicate aspects of traditional *gamelan* learning that rely on attentive listening and memorization. The Stage 1 practice routines were as follows:

a. Single-Note *Tabuh & pathet*. In this introductory routine, participants held a mallet in the dominant hand to strike the keys and used the non-dominant hand to dampen each key after striking. This exercise was designed to familiarize participants with the fundamental concept of striking and dampening, allowing them to develop basic technique before engaging with more complex melodic material.

b. One-Step *Tabuh & pathet*. Once participants were comfortable striking and dampening a single key, a second adjacent key was introduced. Participants struck the first key, then struck the adjacent key while simultaneously dampening the first key with the non-dominant hand. Precise timing of the dampening action is critical: dampening too early results in a detached, disconnected sound, while dampening too late produces an acoustically muddy tone, disrupting the clarity and continuity of the melodic line.

c. Ascending and Descending Scale *Tabuh & pathet*. Building on two-key coordination, participants progressed to playing all keys of the *gamelan* in ascending and descending order while maintaining proper *tabuh & pathet* technique throughout.

d. Simple Melodic Patterns. Upon achieving fluency with ascending and descending scales, participants practiced simple melodic patterns (*gendhing*) involving steps and skips across the keys. All Stage 1 routines were practiced without visual cues; the therapist demonstrated each routine aurally, and participants memorized and reproduced the patterns alongside the therapist. This emphasis on aural learning was intended to stimulate auditory memory and attentive listening while simultaneously developing motor coordination. A mid-intervention post-test using the MMSE was administered to all participants following the completion of Stage 1, approximately one month into the intervention.

In Stage 2, participants continued practicing a broader range of melodic patterns. The therapist encouraged participants to listen attentively to their dyad partner and to coordinate their playing accordingly, emphasizing ensemble awareness and synchronization—central components of traditional *gamelan* performance. In this stage, the therapist also provided a practice booklet containing visual notation for several melodic patterns, with the intention of supporting independent practice outside of scheduled sessions. Although participants were encouraged to internalize the patterns and reduce reliance on the visual notation, in practice they demonstrated considerable dependence on the booklet and engaged less with memorization from memory. Following the completion of Stage 2, the final post-test was administered.

Data were drawn from MMSE pre-test and post-test scores, as well as from session transcripts, to examine the dynamics between dyad partners and the therapist. The combination of quantitative MMSE scores and qualitative observations derived from session transcripts allowed the researchers to examine both measurable changes in cognitive performance and participants' behavioral engagement throughout the intervention.

RESULTS AND DISCUSSION

The result of the MMSE pre-test, first and last post-test can be seen in Table 1. As seen in the table, compared to the pre-test, the first post-test results show a consistent increase in the MMSE test for all participants. Meanwhile, the increase from the first post-test to the final post-test is less consistent among participants. Further study is needed to determine the cause of this result. Our preliminary hypothesis is that the therapist provided a visual cue in the second stage for the participants to practice independently. The process of practicing without a visual cue is more mentally stimulating because not only must the participants maintain a proper *tabuh & pathet* technique, they also need to memorize the melodic pattern while listening to their peer. When we provide the visual cue, the participant will depend on the visual cue to play the melodic pattern and not depend on their memory.

Table 1. *MMSE Pre-Test and Post Test Result*

Participants	Pre-Test	First Post-Test	Final Post-Test
R1	22	26	27
R2	23	24	25
R3	20	24	25
R4	18	26	22
R5	22	27	27
R6	19	25	25
R7	24	26	26

Looking at the sessions' recording and transcripts, a few things arise. First, the act of practicing gamelan stretched the participants' resilience to be able to concentrate longer with each session. In the first sessions, most of the participants hesitated to participate because they felt like they would not be able to play due to their age and ability to learn new skills. Most of them also spent no more than 15 minutes in the first practice session. The reason why the practice routines were structured in a way that starts from the simplest task possible is to get the participants to try playing the gamelan first and see that we are not demanding an impossible task. When we managed to build their confidence in playing the gamelan, we gradually increased the difficulty while giving continuous positive reinforcement. What we observed from the session is that not only did the participants' confidence grow, but also their resilience to stay on task and practice grew longer with each session. By the end of the second stage, most of the participants would sit for more than 30 minutes to practice with their peers. A few even practiced for around 40 minutes.

We paired the participants to try to emulate the real gamelan playing. Even though the pair was playing the same melody - unlike a real gamelan group, in which each played a different melody and interlocked with each other - at the very least, the participants learn to listen to each other and tolerate each other. One of the most crucial things that we want to prevent from happening in old age is social withdrawal, as social stimulation can help stimulate their cognitive performance as well. During the practice, the therapist barely asked the participants to listen to each other. Despite this fact, most of the participants ended up listening

to their peer, helping and encouraging their peer in practice sessions, and trying to play together at the same tempo.

Two of the participants were visibly depressed and had a low mood when they first joined the practice session. We were very careful in adding the difficulty of the tasks for the participants, especially for these two participants. We gave them a lot of verbal encouragement as well. As we went through each session, the two participants were visibly experiencing a change in their mood and willingness to practice. By the third week, we could see drastic changes in their mood. From appearing depressed and unsure to participate, by the third week, they are always eager to start their practice sessions and keep asking when their turn is. Their facial expression also changes positively as the sessions progress.

These observations align with a growing body of research highlighting the positive impact of music engagement on emotional and cognitive well-being in older adults. Music has been shown to activate widespread neural networks involving auditory, emotional, motor, and cognitive processing systems, which makes it a powerful medium for supporting brain health in aging populations. For example, research by Särkämö (2018) and Kim et al. (2023) demonstrates that musical activities—whether listening or actively making music—can provide cognitive, emotional, and social benefits for older adults and individuals with neurological conditions, including improvements in mood regulation and psychological wellbeing.

The human brain controls the attention function in three important ways: by selecting and focusing, by sustaining attention, and by switching attention (Thaut & Hoemberg, 2014). The *tabuh & pathet* technique can help us practice those three functions and is cognitively stimulating. It requires the players to 1) split their focus between right hand and left hand, 2) memorise the keys to dampen and dampening it at the same time as hitting the next key, 3) memorise the melodic pattern, and 4) listen to their peers' playing. This is a lot of tasks in one go, yet the pentatonic keys made it simple enough for beginner players to practice. The rhythmical nature of the *tabuh & pathet* practice can be beneficial for rehabilitation process since rhythm is considered essential in attention training (Miller et al., 2013).

Compared to many traditional music therapy methods for older adults, gamelan practice has unique features that may foster deeper cognitive engagement. First, playing gamelan requires continuous coordination between striking and dampening techniques (*tabuh & pathet*). This process involves motor coordination, careful listening, and sustained concentration. Second, gamelan is traditionally taught through aural transmission. Participants depend more on listening and memory instead of written notation. This learning method can help improve working memory and auditory processing. Third, gamelan is essentially an ensemble-based musical tradition. Players must listen closely to one another and adjust their playing to stay in sync with the group. This collaborative aspect can boost motivation and emotional engagement. Both are key to keeping cognitive stimulation high among older adults.

This study has several limitations that should be noted. First, the small sample size limits how broadly the findings can be applied since only seven participants took part. As a result, the outcomes should be seen as early insights rather than proof of the cognitive benefits of gamelan practice. Second, some of the findings come from qualitative observations based on session transcripts, which adds some subjectivity to the analysis. However, the detailed description of the intervention and participant experiences may help others see how similar

gamelan-based or culturally rooted music activities could be used in different therapeutic or community settings.

CONCLUSION

The practice sessions that were at first aimed to stimulate these seniors cognitively, turned out to give the participants a positive impact socially and emotionally as well. In this study, we have not looked into applying different layers of interlocking melodic and rhythmic patterns within the players. We were only focusing on practicing the *tabuh & pathet* technique in a dyadic setting. A few important things to remember when applying the *tabuh & pathet* practice in therapeutic setting are 1) setting up a safe, comfortable, and non-judgmental space for the clients to throw themselves in the practice, 2) make sure to structure the practice routines and duration of practice so that it matches the client's ability, 3) increases the difficulty gradually, 4) make sure *tabuh & pathet* was properly played and the tone that was produced during practice was sounding clean before moving on to the next practice routine, and 5) balance challenge with positive reinforcement. It can also be important to apply the norm of aural transmission if we want the practice to be more cognitively stimulating. Suggestions for future studies include applying the *tabuh & pathet* technique practice for different clientele, or to a larger number of subjects. Another suggestion is to study the impact of practicing to play interlocking melodic and rhythmic patterns within players on their cognitive performance.

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