Tuning into Success: Evaluating the Acute Effects of Self-Selected Music on Netball Shooting Performance

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ABSTRACT

This study investigated the acute effects of self-selected music on the shooting performance of netball players at UiTM Samarahan, Sarawak. Previous research has shown inconsistent results regarding the impact of music on athletic performance; while some studies indicate significant improvements during training with music, others present contradictory findings. In this study, 41 participants completed three sessions: familiarization, shooting without music, and shooting with self-selected music. Following the session with music, participants completed the Brunel Music Rating Inventory-2 (BMRI-2) questionnaire. The results revealed a significant difference in shooting performance between the sessions without music and those with self-selected music ($p = 0.04$). The motivational properties scores indicated that most participants found music highly motivating (17 participants, 41.5%), moderately motivating (16 participants, 39.0%), or neutral (8 participants, 19.5%). Listening to music may promote relaxation, improve mood, foster a positive mindset, alleviate boredom, boost endurance, and enhance focus. The release of dopamine in response to music may also be a contributing factor.

Keywords: Music, self-selected, shooting performance, Brunel Music Rating Inventory-2

INTRODUCTION

Netball is a team sport typically played by women, with each team consisting of seven players. The game is conducted on a rectangular court with raised goal rings at each end, where the objective is to score by shooting the ball into a ring mounted on a post 3.05 meters high. Netball is a dynamic and high-intensity sport, played over 60 minutes and divided into four 15-minute quarters, with 4-minute breaks between each quarter (Whitehead et al., 2021). The seven positions in netball include goal shooter (GS), goal attack (GA), wing attack (WA), center (C), wing defense (WD), goal defense (GD), and goalkeeper (GK). The rules restrict players to specific areas of the court, require them to release the ball within three seconds of receiving it, and limit movement to one step while in possession of the ball.

Music therapy has emerged as an effective coping strategy for athletes. Music, an integral part of daily life, is easily accessible and can be incorporated into various routines. It inspires athletes and enhances their self-confidence (Karageorghis et al., 2012). Previous research has demonstrated that music can improve athletic performance during exercise. Furthermore, music aids in relaxation by diverting attention away from discomfort and fatigue. For instance, American swimmer Michael Phelps famously listened to music up to two minutes before his competitions to achieve the right mindset. Music facilitates the body's ability to perform repetitive actions more efficiently by activating brain regions responsible for movement control. This synchronization can lower blood pressure, alleviate physical and emotional stress, and enhance metabolism and energy efficiency.

METHOD AND MATERIALS

Research Design and Participants

A pre-experimental study was conducted among netball players at UiTM Sarawak, Samarahan, from April to June 2024. Approval for the study was granted by the UiTM Research Ethics Committee. A total of 41 subjects participated in the study.

Data Collection Procedures

This study involved 41 netball players from UiTM Kampus Samarahan, selected through convenience sampling. The inclusion criteria required participants to be female netball players who were recreationally active. All subjects were asked to volunteer for the study, which included assessing shooting performance with and without self-selected music. Each participant provided informed consent and completed a Physical Activity Readiness Questionnaire (PAR-Q). The study consisted of three sessions: familiarization, shooting without music, and shooting with self-selected music.

During each session, participants began with a warm-up. They were then required to take four shots from both the left and right sides of the netball rim, at a 45° angle from the backline of the netball post, and from a distance of 3 meters. An additional four shots were taken directly in front of the netball post (middle position) from the same distance of 3 meters (see Figure 1). During the familiarization session, participants took a total of six shots (two from each position). In the sessions with and without self-selected music, participants took 12 shots per session (four from each position). The cumulative score from these shots was used to assess the motivational properties of the music. Each shot was recorded by the researcher based on the scoring criteria outlined in Table 1.

Table 1: Scoring description for shooting performance

Score	Description
0	Complete miss
1	Hit the rim and miss
2	Hit the rim and score the basket
3	Clean basket

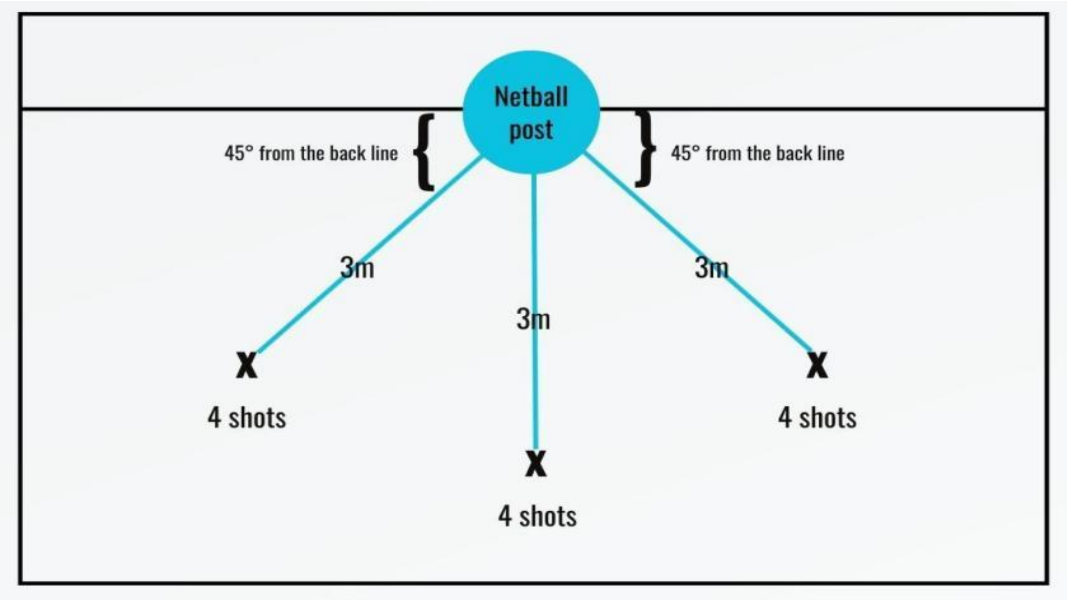

Figure 1: Shooting position of subjects

Participants listened to self-selected music using their earphones and smartphones during the shooting task. After completing the shooting task with music, participants filled out the Brunel Music Rating Inventory-2

(BMRI-2), which evaluates six aspects of music: rhythm, style, melody, tempo, instrumental sound, and beat. Each item was rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The internal consistency of the BMRI-2 in this study was high, with an alpha coefficient of 0.95. The shooting performance was quantified by summing the scores from all 12 shots. The rating scores are detailed in Table 2.

Table 2: Total score description for BMRI-2 questionnaire

Score	Description
36-42	Highly motivating
24-36	Moderately motivating
<24	Oudeterous

Data Analysis

Descriptive statistics, including means, standard deviations (SD), frequencies, and percentages, were used to summarize the data, making it easier to interpret. Demographic variables such as age, weight, and height were also analyzed using descriptive statistics. Inferential statistics were applied to test the hypotheses, with the paired t-test used to compare shooting performance with and without the self-selected music intervention.

Statistical Analysis

All data analyses were conducted using the Statistical Package for Social Science (SPSS) version 27.0. Descriptive statistics were used to calculate means and standard deviations for the Brunel Music Rating Inventory-2 scores. Inferential statistics, specifically the paired t-test, were employed to evaluate the difference in shooting performance with and without self-selected music. Statistical significance was set at $p < 0.05$.

RESULTS

Participants

Table 3 presents the demographic data, including age, weight, and height, of the participants in this study. A total of forty-one (N = 41) recreationally active netball players from UiTM Samarahan, Sarawak, participated in the research. The mean age of the participants was 20.54 years, with a standard deviation of ±1.34, and the age range spanned from 18 to 23 years. The mean weight of the participants was 50.34 kg, with a standard deviation of ±11.06, and the mean height was 158.88 cm, with a standard deviation of ±4.52.

Table 3: Demographic Information

	N	Minimum	Maximum	Mean	±Std. Deviation
Age (years)	41	19	23	20.54	1.34
Weight (kg)	41	34	80	54.34	11.06
Height (cm)	41	150	169	158.88	4.52

Descriptive statistics

Descriptive statistics were also calculated, as shown in Table 4. The mean score for the Brunel Music Rating Inventory-2 (BMRI-2) was 28.78, with a standard deviation of ±6.16. This score reflects the extent of the motivational properties associated with music during the shooting performance.

Table 4: Descriptive Statistics for Brunel Music Inventory – 2

	M	±SD
Scoring BMRI-2	28.78	6.16

The BMRI-2 was utilized to assess the motivational impact of music on shooting performance. As shown in Table 5, 8 out of 41 participants (19.5%) rated the music as neutral (oudeterous), 16 participants (39.0%) found it moderately motivating, and 17 participants (41.5%) found it highly motivating.

Table 5: Motivational properties scoring for BMRI-2

	Frequency (f)	Percentage (%)
Oudeterous	8	19.5
Moderately motivating	16	39.0
Highly motivating	17	41.5

Inferential Statistics

A paired sample t-test was conducted to evaluate the acute effect of music on the shooting performance of netball players. The results indicated a statistically significant improvement in shooting performance from the session without music (M = 0.89, SD = 0.05) to the session with self-selected music (M = 1.00, SD = 0.50), t(40) = -2.09, p = 0.04 (two-tailed). Consequently, the null hypothesis was rejected.

	Mean	N	Std. Deviation
Shooting without music	0.89	41	0.05
Shooting with self-selected music	1.00	41	0.05

Table 6: Paired Sample T-Test

	Mean	Std. Deviation	t	df	Sig (2-tailed)
Shooting without music and shooting with self-selected music	-0.10	0.31	-2.09	40	0.04

DISCUSSION

The primary aim of this research was to compare the acute effects of self-selected music versus no music on shooting performance. The findings suggest that music, when self-selected by athletes, can enhance mood and motivation, providing immediate benefits. Previous studies have also indicated that music can serve as an ergogenic aid, improving athletic performance (Ballmann, 2018; Schluter, 2022). In this study, a statistically significant difference was observed between shooting with self-selected music and shooting without music ($p < 0.05$), with self-selected music leading to notable improvements in performance. Overall, participants demonstrated superior shooting performance when listening to their preferred music compared to when no music was played.

According to Ballmann et al. (2021), music has been shown to mitigate the perception of fatigue and enhance overall performance. The observed improvements in shooting performance in this study may be attributed to increased dopamine production in the brain while listening to music. Dopamine, a neurotransmitter associated with pleasure and reward, can reduce anxiety and elevate mood, thereby enhancing shooting performance (Fong, 2024). Enjoyable music activates the brain's reward system, leading to heightened feelings of euphoria and improved emotional and physical states. These effects are consistent with the positive emotions and heightened sense of well-being associated with music.

However, these results contrast with those reported by Baharuddin (2020), who found no significant difference in shooting performance between conditions with and without self-selected music ($p = 0.206$). Discrepancies in findings could be attributed to variations in study settings and participant familiarity with the environment. Unfamiliar surroundings and background noise might also influence performance, as participants may require additional time to acclimate to new conditions.

Additionally, the significance of the results may be influenced by music's role in optimizing arousal levels during shooting. Prior research has demonstrated that music can enhance arousal, which in turn improves

exercise performance (Ballmann et al., 2018). Music facilitates focus and relaxation, enabling athletes to maintain self-control and improve their shooting accuracy. Allowing participants to choose their own music likely influenced their arousal levels and overall motivation. When athletes enjoy the music they listen to, it can bolster motivation and generate positive emotions.

Despite these findings, the mean scores indicate that most participants scored a 0 (complete miss) when shooting without music and a 1 (hit the rim and miss) when shooting with self-selected music. Although there was an improvement, the mean scores reflect only a modest enhancement in performance, which contrasts with the BMRI-2 motivational properties scoring, where most participants reported music as highly motivating during shooting. This discrepancy may be attributed to participants' potential loss of shooting skills due to infrequent play or lack of proficiency in the Goal Shooter (GS) position.

The observation that participants found enjoyment in listening to music while shooting, despite only modest performance improvements, suggests that the music positively impacted their mood and motivation. Thus, participants may have perceived that they were exerting more effort and working harder during the music condition, leading to an enhanced experience.

CONCLUSION

This study sought to examine the acute effects of self-selected music on shooting performance among netball players at UiTM Samarahan, Sarawak. Participants engaged in three distinct shooting sessions: familiarization, shooting without music, and shooting with self-selected music. The results revealed a statistically significant improvement in shooting performance when self-selected music was used, compared to shooting without music ($p = 0.04$). However, this finding did not align completely with the Motivational Properties Scoring of the Brunel Music Inventory-2 (BMRI-2).

Although the mean scores for shooting performance with and without preferred music indicated only a slight difference, the BMRI-2 results showed that a significant proportion of participants (41.5%, or 17 participants) found the music highly motivating. Observational data suggest that music positively affected participants' moods, reducing stress and increasing enjoyment during shooting. Music likely facilitated a reduction in stress levels by stimulating the parasympathetic nervous system, which helps calm the body and lower cortisol, a stress hormone. Hence, future researchers should investigate the relationship between training and music with appropriate periods to explore the potential between them.

RECOMMENDATIONS

This study offers several avenues for future research that could enhance and build upon its findings. First, it would be beneficial for future studies to compare the effects of self-selected music with music selected by the researcher on participants' performance. Given the diverse nature of individual music preferences, examining whether music not chosen by the participant still has a significant impact could provide valuable insights.

Additionally, exploring the effects of varying durations of music exposure, such as during shooting performances over extended periods (e.g., 4 or 6 weeks), could offer a deeper understanding of its influence. Comparing outcomes from a single session with those from longer training periods could yield important information on the efficacy of music as a performance aid over time.

Finally, future research could investigate the impact of the sequence in which music is introduced. Specifically, studying whether performing shooting tasks with self-selected music first, followed by shooting without music, affects performance differently compared to the reverse sequence could provide further insights. This approach would help determine whether the sequence of music and non-music conditions influences shooting performance outcomes.

Ethical Approval

Ethical approval for this study was obtained from the Ethics Committee of Universiti Teknologi MARA (UiTM).

Conflict Of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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