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The Effect of Music on Improving the Concentration of Badminton Athletes

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Abstract. This study aimed to examine the effect of music on improving the concentration of badminton athletes. A quantitative methodology was applied, utilizing a pretest-posttest control group framework. Twelve active badminton club athletes aged 18-22 years were randomly allocated to experimental (n=6) and control (n=6) groups. The experimental group listened to self-selected music for ten minutes before training over a four-week period, whilst the control group sat quietly without music. Concentration was measured using the Concentration Grid Test (CGT) before and after the intervention. Results showed that the experimental group demonstrated a significant increase in concentration scores from pre-test (M=15.50, SD=2.168) to post-test (M=20.00, SD=1.897), while the control group showed minimal change (pre-test: M=11.83, SD=0.753; post-test: M=15.83, SD=0.753). These findings indicate that listening to self-selected music before training measurably enhances badminton athletes' concentration capacity through mechanisms of arousal regulation and attentional focus. Based on these outcomes, it is recommended that a music protocol should be adopted as a cost-effective, easily accessible, and scientifically evidence-based mental preparation strategy, particularly for coaches or institutions with limited access to professional sports psychologists.

Keywords: Badminton; Improving Concentration; Badminton Athletes

INTRODUCTION

Badminton has become an integral part of Indonesian culture and is popular across generations, in both urban and rural areas (Illiyin et al., 2023; Tabernakel et al., 2023). Badminton is played by two or four players on a rectangular court with a high net in the middle (Rusdiana et al., 2020). Amidst this diversity, sport helps to strengthen the nation's identity, as reflected in the high level of public support for athletes on the international stage (Luqiyah, 2024). An athlete's strength comes not only from their physical condition, but also from a strong mental attitude. A mature mindset helps them to remain calm, focused and confident, both during training and in competition. In badminton, the key to this mental preparedness is concentration (Komarudin et al., 2020). At a competitive level, an athlete's success is not only underpinned by physical and technical ability, but also depends heavily on psychological factors, particularly concentration. This sport demands quick reactions, precise decision-making, and emotional stability throughout the fluctuating course of a match (Rifka Alkhilyatul Ma'rifat, I Made Suraharta, 2024; Terry, Karageorghis, et al., 2020).

The phenomenon of concentration is defined as the ability to focus one's attention selectively on critical information that determines the successful execution of tasks during a match (Sholichah & Jannah, 2015). Crucial moments, such as a tight score or a decisive point, require sustained mental focus, as even minor discruptions can immediately affect performance quality (Raibowo et al., 2023). A loss of concentration under pressure is the main obstacle to optimising the performance of badminton players (Ryzki et al., 2021). Observations at the UPI Badminton Club indicate that execution errors are often caused by external distractions (such as the noise of the spectators) or internal factors (such as anxiety and mental fatigue), leading to an increase in unforced errors (Shah et al., 2020; Tan & Teoh, 2024). Empirical data confirms that a 10% reduction in pressure can increase unforced errors by up to 25% (Kadir et al., 2023). Conventional mental preparation strategies, such as quiet eye training, have proven to be effective in improving focus (Vickers, 1996, 2007). However, it requires intensive training, a long adaptation period and expert guidance, making it impractical to implement on a regular basis. A more concise, easily implementable and scientifically evidence-based approach is needed.

One practice that has been widely adopted informally by athletes is listening to music through earphones before training or a match. Although this is a mental preparation ritual, its use is not yet based on measurable empirical evidence (Choi et al., 2025; Putra et al., 2019; Terry et al., 2007). Scientifically, pre-task music has been shown to be effective in stabilising emotional arousal, reducing anxiety and improving cognitive readiness (Karageorghis, Ekkekakis, Jonathan, 2017). A recent meta-analysis also confirms that music played before an activity has a significant positive effect on affective valence ($g = 0.48$) and physical performance ($g = 0.31$) (Terry, Curran, et al., 2020). However, the majority of research on music and concentration still relies on static laboratory tasks that do not fully reflect the cognitive demands of dynamic sports (Russell et al., 2020; Terry, Curran, et al., 2020). Existing literature has not yet specifically investigated the effectiveness of music as a structured intervention prior to badminton training using validated measures of concentration in a dynamic context (Greenlees et al., 2006; Terry, 2011).

The primary contribution of this research centers on the the transformation of music use from a mere informal habit into a structured protocol that has been empirically tested in the context of dynamic sport. This study involved the systematic provision of 10 minutes of music as a pre-exercise intervention (before physical activity began) over a period of 4 weeks (12 sessions) (di Fronso & Budnik-Przybylska, 2023; Gill & Singh, 2024; Jebabli et al., 2022). The impact was measured using the Concentration Grid Test (CGT), developed by Harris & Harris (1984) and validated in a sporting context (Cui et al., 2025; Greenlees et al., 2006; Ömer Aydın, Erman Doğan, Ezgi Sevilmiş, 2024). Using a rigorous two-group pretest-posttest design to isolate the specific effects of music (Ibáñez & Feu, 2026; Paul McCarthy, Sahen Gupta, 2025; C. Zhang et al., 2026).

Against this background, this study aims to investigate the effect of music on improving the concentration of badminton players. The urgency of this study is of a practical and applied nature: music is low-cost interventions that are easily accessible and can be immediately adopted by coaches, particularly in institutions with limited access to professional sports psychologists (Karageorghis, Ekkekakis, Jonathan, 2017).

Without an evidence-based mental preparation strategy, athletes risk choking under pressure, which can hinder their ability to perform at their best in regional and national competitions (Mesagno et al., 2019). It is hoped that the findings of this study

will provide an empirical basis for the use of music as a measurable, efficient and effective mental preparation protocol for improving the concentration of badminton players.

METHOD

This study employs a quantitative approach using a two-group pretest-posttest experimental design to examine the effect of music's on athletes's concentration (Creswell & Creswell, 2023; Perreault, 2011). This design compares changes in scores between the experimental and control groups using pre- and post-intervention measurements, with random assignment to minimise selection bias and ensure internal validity (Feizi, 2024; MacIas et al., 2009; C. Zhang et al., 2026). The participants comprised 12 active athletes from the UPI Badminton Club who met the inclusion criteria: (1) aged 18–22 years, (2) having attended regular training sessions at least three times a week over the past six months, and (3) having no hearing impairment or history of medication use that affects cognitive function (Cui et al., 2025).

Participants were randomly allocated to two groups (n = 6 each) using a simple randomisation technique to ensure that baseline characteristics were comparable before the intervention began, given the limited population of active athletes in the UPI Badminton Club and the practical constraints of conducting a field-based intervention, this study utilized a small sample size. Consequently, the calculated effect sizes and overall findings should be interpreted with caution, and further replication with larger samples is recommended. (Paul McCarthy, Sahen Gupta, 2025). Concentration levels were measured using the Concentration Grid Test (CGT), which consists of a matrix of two-digit numbers (00–99) arranged in a random order. Participants were asked to find and mark the numbers in sequential order from smallest to largest within 60 seconds, with the final score calculated based on the number of numbers marked correctly and in sequence (Ömer Aydın, Erman Doğan, Ezgi Sevilmiş, 2024). This instrument has been validated in recent studies to measure visual-attentional capacity and the speed of cognitive processing relevant to the demands of rapid decision-making in dynamic sports (Cui et al., 2025).

The interpretation of scores is based on the standard categories used in the current sports psychology literature: 21–28 (very good), 16–20 (good), 11–15 (adequate), 6–10 (poor), and ≤5 (very poor) (C. Zhang et al., 2026). To maintain objectivity and avoid the

learning effect, the post-test assessment uses a parallel form of the CGT test, which has an equivalent level of difficulty but a different arrangement of numbers (Paul McCarthy, Sahen Gupta, 2025). The experimental group received an intervention involving listening to their own choice of music (self-selected preferred music) through earphones for 10 minutes whilst sitting quietly, immediately before the training session began (Delleli et al., 2023). Athletes were instructed to choose songs that are motivational, familiar and have lyrics that do not disrupt cognitive focus, in line with the recommendations of the pre-task music protocol, which has been shown to consistently improve psychological readiness (Jebabli et al., 2022; Terry, Curran, et al., 2020).

The intervention programme is scheduled to take place three times a week for four weeks (12 sessions in total) to facilitate the process of mental habituation and stabilise the athletes' psychological responses. This protocol was developed based on previous studies supporting the effectiveness of regular music exposure as a mental preparation strategy in a sporting context (Delleli et al., 2023; Terry, Curran, et al., 2020). Meanwhile, the control group undertook an equivalent pre-exercise activity, consisting of sitting quietly for 10 minutes without exposure to music, before proceeding to a standard physical warm-up session. Data collection was carried out in three structured stages: (1) Pre-test: Measurement of initial concentration using the CGT before the exercise began; (2) Intervention: Administration of the music protocol according to schedule over four weeks with adherence; (3) Post-test: Concentration was re-measured after the final session using the CGT form (Paul McCarthy, Sahen Gupta, 2025; C. Zhang et al., 2026). The data were analysed using IBM SPSS Statistics (Rahman & Muktadir, 2021). Tests of classical assumptions include the normality of the data distribution (Shapiro-Wilk) and the homogeneity of variances (Andy Agustian et al., 2025).

RESULT AND DISCUSSION

Result

The study's findings were derived by analysing statistical data via IBM SPSS Statistics (Elzati, 2024). Subsequently, the outcomes quantitative analysis are summarised as tables and figure.

Table 1. Descriptive Statistics

Test	N	Min	Max	Mean	Std.Dev.
Pre control	6	11	13	11,83	0,753

Post control	6	11	13	15,83	0,753
Pre experiment	6	13	18	15,5	2,168
Post experiment	6	18	22	20	1,897

This section presents a description of the data from 12 research subjects divided into two groups. As shown in Table 1, the control group, comprising 6 subjects, had a minimum score of 11, a maximum score of 13, a mean of 11.83, and a standard deviation of 0.753. Meanwhile, in the experimental group, which also consisted of 6 subjects, the minimum score was 13, the maximum reached 18, with a mean of 15.5 and a standard deviation of 2.168. Furthermore, based on the post-test data shown in the table, the control group recorded a minimum score of 11 and a maximum of 13, with a mean of 15.83 and a standard deviation of 0.753. For the experimental group, there was an increase in scores, with a minimum of 18, a maximum of 22, a mean of 20, and a standard deviation of 1.897. The results of the normality test are summarised in Table 2.

Table 2. Shapiro Wilk Normality Test

Test	statistic	df	Sig.
pre kontrol	.866	6	.212
post kontrol	.866	6	.212
pre eksperimen	.867	6	.215
post eksperimen	.833	6	.113

Table 2 summarises the Shapiro-Wilk normality assessment outcomes for all four measurement conditions. In the control group, the test yielded a statistic of 0.866 based on 6 df, corresponding to a p-value of 0.212 for both the pre-test and post-test. Meanwhile, in the experimental group, the pre-test produced a statistic of 0.867 with an associated significance level of 0.215, whilst the post-test returned a value of 0.833 with a p-value of 0.113. Given that all p-values across both groups and testing phases exceeded the 0.05 threshold, the data meet the criteria for normal distribution, fulfilling the prerequisite assumption and thus permitting the subsequent homogeneity analysis.

Table 3. Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Nilai	Based on Mean	0,003	1	22	0,959

Based on the results of the test for homogeneity of variances using Levene's test, as presented in Table 3, a Levene's statistic of 0.003 was obtained, with degrees of freedom of 1 (df1) and 22 (df2). The significance value obtained was 0.959. As the significance value (0.959) is greater than the significance level α = 0.05, it can be concluded that the variability across both study groups was confirmed to be homogeneous.Thus, the assumption of homogeneity of variance has been met in this study, indicating that both groups have equivalent data variability.

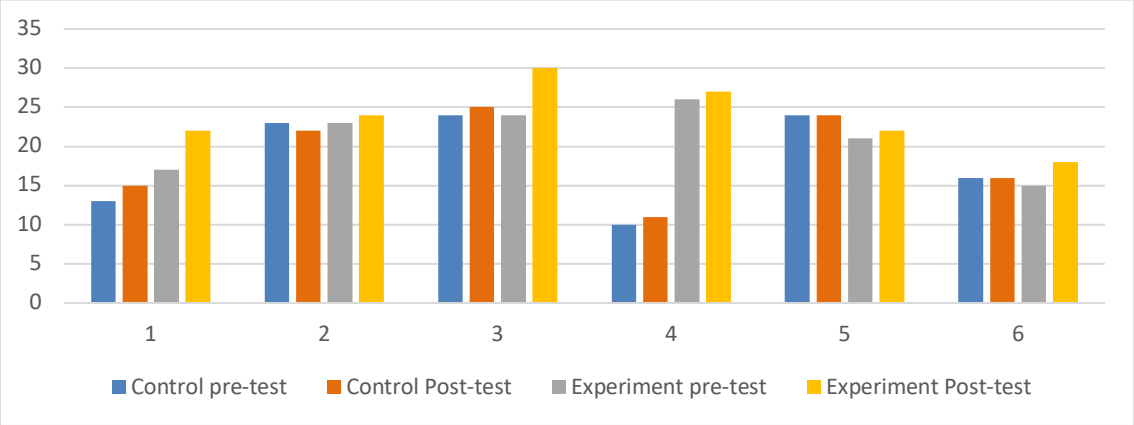

Figure 1. Comparison of Pre-test and Post-test Concentration Scores in the Control and Experimental Groups

Figure 1 depicts concentration trajectories across six time-points under four experimental conditions. Colour coding denotes: blue/orange = control pre/post; grey/yellow = experimental pre/post. Visually, the plot reveals that trajectories display variability, reflecting fluctuations in the athletes' concentration levels during each observation session. A more detailed examination reveals that the experimental conditions (grey and yellow) exhibit a steadier upward trajectory between baseline and follow-up relative to controls. This pattern implies that participants who listened to self-selected music prior to training demonstrated a stronger propensity for enhanced focus. This outcome aligns with prior evidence indicating that self-selected music can enhance focus, as it aligns with individual preferences and fosters an affective state conducive to performance (Terry, Curran, et al., 2020).

Discussion

The findings of the present investigation suggest that listening to self-selected preferred music for 10 minutes prior to exercise improves Concentration Grid Test (CGT)

scores in badminton athletes. These findings are consistent with recent evidence that pre-exercise music serves as an effective mental preparation strategy for stabilising athletes' focus prior to intense physical activity (Delleli et al., 2023). In the context of badminton, which demands quick reflexes and sustained concentration, music chosen by the athletes themselves is thought to help create a more prepared mental state, enabling them to maintain their focus on the task at hand on the court (Delleli et al., 2023; Jebabli et al., 2020).

The more consistent improvement in concentration observed in the experimental group also supports the finding that self-selected music has a stronger psychological impact than music chosen by the researcher. This is because the emotional connection and sense of familiarity with the chosen songs can maximise motivational responses without overburdening the athletes' attention (Hutchinson, J. C., Jones, L., 2018; S. Zhang et al., 2023). Furthermore, the 10-minute intervention duration used in this study proved to be practical and in line with the recommendations of effective pre-exercise music protocols for short-duration anaerobic activities such as badminton (Karow, Rebecca, Pederson, Tyler, 2020; Pounds et al., 2026). The use of parallel-form CGT sheets in the post-test also succeeded in minimising the learning effect, so that the increase in scores truly reflected changes in concentration capacity, rather than mere adaptation to the instrument (Ballmann, Christopher et al., 2019; Rogers et al., 2023). From a mechanistic perspective, the increase in concentration following exposure to music can be explained through the framework of arousal regulation and attentional focus.

Musical stimulation tailored to an individual's preferences can help athletes achieve an optimal level of alertness—neither too tense nor too relaxed—so that their attention can be effectively directed towards relevant stimuli on the field (Delleli et al., 2023; Jebabli et al., 2023). In high-pressure situations, the ability to maintain focus on the shuttlecock, the opponent's position and game strategy whilst ignoring external distractions is a key determinant of performance quality. Pre-match music is thought to act as an 'attention anchor' that prepares the athlete's visual-attentional focus system before the match begins (Gavanda et al., 2022; Nixon et al., 2022). Although the results support the hypothesis, there are methodological limitations that need to be taken into account. The small sample size (N = 12) and the homogeneity of the participants (aged

18–22 years from a single student sports club) limit the generalisation of the findings to higher levels of competition or different age groups. Furthermore, leaving the choice of music entirely to the athletes without strict control over acoustic parameters (tempo, lyrics, genre) has the potential to create variations in individual responses that are difficult to standardise statistically (Belkhir,ghazi, 2022; Terry, Curran, et al., 2020).

CONCLUSION

This study confirms that listening to personally selected music for 10 minutes prior to a training session can measurably improve badminton players' concentration capacity. This intervention acts as a mechanism for regulating alertness, helping athletes achieve an optimal mental state, minimise distractions, and focus their attention on the technical demands of the court. From a practical perspective, this protocol offers a cost-effective, easily adoptable, and highly strategic alternative for mental preparation for coaches or institutions working with limited access to professional sports psychologists. Although these findings provide initial empirical evidence, several methodological limitations should be acknowledged. The intervention duration was relatively short (four weeks), which may not be sufficient to establish long-term concentration adaptation. Furthermore, the use of self-selected music introduces high individual subjectivity, making it difficult to standardise psychological responses across participants. Finally, the absence of physiological measurements, such as heart rate or objective arousal levels, means that the underlying biological mechanisms of the music intervention remain unverified. Nevertheless, the results suggest that pre-training music can be transformed from an informal habit into a structured component of athlete development programmes.

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