INPLASY

Can Music Restore Mental Fatigue and Enhance Sports Performance? A Systematic Review and Conceptual Framework

Corresponding author:
Xiaoyang Pan

panxiaoyang.mark@gmail.com

Author Affiliation:
Department of Sport Studies,
Faculty of Education Studies,
Universiti Putra Malaysia, Selangor,
Malaysia.

Pan, XY; Soh, KG; Soh, KL.

INTRODUCTION

*R*eview question / Objective This systematic review aims to integrate existing literature on music interventions and mental fatigue, systematically exploring the application of music interventions in alleviating mental fatigue and their potential impact on athleticperformance.

Rationale The impact of mental fatigue on athletes during high-intensity competitions is nearly unavoidable. Music therapy has shown significant effects in the medical field as a low-risk and non-invasive intervention. Yet, systematic research on its influence on mental fatigue in athletes still needs to be completed, with no unified explanatory mechanism established.

Condition being studied Mental fatigue has emerged as a critical factor leading to performance decline among athletes and is nearly unavoidable during competitions. Research has shown that mental fatigue can impair self-control, weaken physical capabilities, and damage skill-specific performance. Therefore, developing effective psychological recovery strategies to address mental fatigue and enhance athletic performance has become a key objective in sports science research today.

In the field of sports science, music has been found to have a positive impact on physical activities. Through a systematic review of 139 studies involving 3,599 participants, Terry et al. (2020) found that listening to music during physical activities significantly enhances positive emotional valence, reduces perceived exertion, and improves physical performance. Many studies suggest that the detrimental effects of mental fatigue on skill performance may be attributed to reduced dopamine transmission, negatively affecting executive function. Therefore, researchers have suggested that, to counter mental fatigue, recovery strategies that modulate the dopaminergic system —such as music or caffeine—are necessary.

However, the effects of music interventions on athletes' mental fatigue have yet to be systematically studied, and the mechanisms by which music interventions regulate mental fatigue

and enhance athletic performance are also underexplored. This limits coaches, athletes, and sports researchers in their understanding of the application of music interventions in sports. For reproducibility and comparability, clearly describing the mechanisms of music therapy and intervention is essential. Therefore, a new model or conceptual framework is needed to connect these factors and offer comprehensive recommendations for future research.

METHODS

Search strategy Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021), we conducted a systematic search of electronic databases, including PubMed, Web of Science, Scopus, and SPORTDiscus, as of November 2, 2024. The search string was (music) AND ("mental fatigue" OR "psychological fatigue" OR "cognitive fatigue" OR "mental effort" OR "cognitive effort" OR "mental exertion" OR "ego depletion"). Terms within the same theme were combined with OR, and terms from different themes were combined with AND. A standardised search procedure was applied across all databases.

Participant or population Participants must be healthy individuals.

Intervention The intervention group must receive a music intervention (participants are the recipients of a music experience rather than performers of tasks that may induce additional cognitive load, such as music learning or instrument playing).

Comparator The control group must receive a different form of music intervention or no music intervention at all.

Study designs to be included RCT; nRCT; nRnCT.

Eligibility criteria Outcome measures must include an assessment of mental fatigue.

Information sources PubMed, Web of Science, Scopus, and SPORTDiscus.

Main outcome(s) Results indicate that music interventions alleviate mental fatigue and enhance fine motor control and endurance performance. However, studies on its application across various sports and athletic skills still need to be completed. Based on existing findings, this review proposes a dopamine-mediated conceptual framework that integrates the psychobiological model of exercise performance with the neuroplasticity model of music therapy, aiming to provide scientific guidance for future research and practical applications.

Additional outcome(s) Future studies should focus on standardising music interventions, especially optimising music type and determining the minimum effective duration of intervention, to enhance the practical utility of this approach further.

Data management The literature was managed using EndNote, and the workflow was as follows: (i) recording the total number of search results; (ii) using the "title, abstract, and keyword" filter in databases to narrow the search range; (iii) removing duplicates; (iv) manually screening titles and abstracts to determine relevance to the topic of music intervention and mental fatigue; (v) conducting a full-text review and data extraction.

Quality assessment / Risk of bias analysis Study methodological quality was assessed using the "QualSyst" tool (Kmet, 2004), which includes 14 criteria: I, description of the research question; II, appropriateness of study design; III, reasonableness of subject selection; IV, description of subject characteristics; V, random allocation; VI, blinding of researchers; VII, blinding of participants; VIII, clarity of outcome measures and resistance to bias; IX, appropriateness of sample size; X, description of analytic methods; XI, reporting of variance estimates; XII, control for confounding variables; XIII, thoroughness of result reporting; XIV, support of conclusions by the results. Scoring depends on whether each criterion is met (Yes = 2, Partial = 1, No = 0). If a criterion does not apply to the study design, it is marked "N/A" and excluded from the total score calculation. A score ≥75% indicates strong quality, 55–75% indicates moderate quality, and ≤55% indicates weak quality. Studies rated as weak/poor quality were excluded.

Strategy of data synthesis Screening was conducted independently by two researchers, who then compared their results. In case of disagreement, a third researcher was consulted to reach a consensus.

Subgroup analysis Data extraction from included studies was conducted independently by two researchers, with cross-checking of results. Any disagreements were discussed with a third researcher until consensus wasreached.

Sensitivity analysis Data extraction from included studies was conducted independently by two

researchers, with cross-checking of results. Any disagreements were discussed with a third researcher until consensus wasreached.

Language restriction Exclude non-English articles.

Country(ies) involved Malaysia and China.

Keywords music; mental fatigue; performance; intervention; conceptual framework.

Contributions of each author
Author 1 - Xiaoyang Pan.
Email: panxiaoyang.mark@gmail.com
Author 2 - Kim Geok Soh.
Author 3 - Kim Lam Soh.