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Review Article

Music interventions in exercise performance, recovery and sleep: a scoping review

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ABSTRACT

Music has been investigated as a potential influence on exercise performance, perceived exertion, recovery, and sleep. However, studies vary in their interventions, populations, exercise contexts, and measured outcomes. This scoping review aimed to map experimental evidence on music interventions in resistance, isometric and handgrip, aerobic exercise, acute recovery, and sleep, and to identify evidence gaps. PubMed/MEDLINE, SPORTDiscus, Scopus, and Web of Science were searched for studies published between 1980 and October 2026. Eligible studies involved human participants, compared a music intervention with a control or alternative condition, and reported exercise performance, perceived exertion, psychological responses, physiological recovery, or sleep outcomes. Screening was conducted using Rayyan. Findings were synthesised descriptively across four domains. Thirty studies involving 1,183 participants were included. Studies were published between 1981 and 2021 and examined resistance exercise (n=11), isometric and handgrip exercise (n=8), aerobic exercise and acute recovery (n=7) and sleep (n=4). The evidence maps a broad range of music interventions and outcomes, with variable findings across exercise and sleep contexts. Research gaps include limited participant diversity and insufficient investigation of sleep and recovery in athletic populations. Further studies are needed to clarify how music characteristics, individual preferences, and task demands relate to outcomes.

Keywords: Music, Exercise, Athletic performance, Sleep, Recovery of function

INTRODUCTION

Music during exercise has received considerable research attention because it is a readily accessible intervention that may influence exercise performance and the experience of physical effort. Music may influence arousal, direct attention away from fatigue, and affect mood during exercise. Several mechanisms have been proposed to explain these potential effects on mood, attention, and behaviour.[1,2] A meta-analysis of research in sport and exercise reported effects of music on affective responses, perceived exertion, and performance.[3] However, the magnitude and consistency of these effects may vary across outcomes and exercise contexts.

The effects of music may vary according to the characteristics of the musical stimulus, individual preferences, and the demands of the exercise task. Initial experiments suggested that stimulative and sedative music may have different effects on muscle strength.[4,5] Since then, studies have examined musical characteristics, including genre, tempo, volume, and individual preference, across a range of tasks, from maximal strength testing to treadmill running. The outcomes investigated have also varied across studies. Some studies have measured physical performance outcomes, such as strength, repetitions, and endurance. Others have assessed rating of perceived exertion (RPE), a subjective measure of perceived exercise intensity, psychological responses, and physiological measures such as heart rate and heart

rate variability.[6-8] Mapping these variations may help characterize the scope of the existing evidence and identify areas in which findings are limited or inconsistent.

Music has also been studied in relation to acute recovery and sleep, extending the scope of research beyond exercise performance alone. Randomised trials in adults with insomnia have investigated the effects of bedtime music on sleep-related outcomes, including sleep onset and sleep quality.[6,7] Sleep and recovery represent related but distinct areas of investigation. Although studies involving adults with insomnia may inform understanding of music and sleep-related outcomes, their findings cannot automatically be generalised to athletes or interpreted as evidence of improved post-exercise recovery. Mapping these studies alongside exercise-performance and acute-recovery research may help clarify the populations, interventions, and outcomes investigated in each domain and identify gaps in the evidence.

Research on music in exercise and sport encompasses a range of interventions, exercise modalities, participant populations, and outcomes. Although existing reviews and meta-analyses have synthesized aspects of music in sport and exercise, the characteristics and distribution of experimental evidence across exercise performance, perceived exertion, acute recovery and sleep warrant further examination.[1-3] Examining these domains together may help characterize the interventions and outcomes studied, describe patterns in the reported findings, and identify areas where evidence remains limited.

This scoping review aims to map the characteristics, scope, and distribution of experimental evidence on music interventions across resistance exercise, isometric exercise, aerobic exercise, acute recovery, and sleep. It seeks to describe the study designs, participant populations, music interventions, comparators, and outcomes represented in the literature; map the reported findings across these domains and describe factors investigated in relation to variation in outcomes; and identify evidence gaps and priorities for future research.

METHODS

Review design and reporting

This scoping review was designed to map the characteristics, scope, and distribution of experimental evidence on music interventions across resistance exercise, isometric exercise, aerobic exercise, acute recovery, and sleep.

Reporting was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). No review protocol was registered.[9]

Databases searched and search dates

The following databases were searched: PubMed/MEDLINE, SPORTDiscus, Scopus, and Web of Science. The searches were run on October 1, 2026, and covered records from 1980 to October 2026. The reference lists of included studies were also screened manually.

Search strategy

Search terms were organised around three concepts, combined with Boolean operators. Synonyms within a concept were joined with OR, and concepts were joined with AND. Truncation (*) captured word variants.Music concept: music* OR "preferred music" OR "self-selected music" OR "motivational music" OR "music tempo" OR "sedative music" OR "stimulative music"; Exercise or recovery concept: exercise* OR "resistance training" OR "bench press" OR "handgrip" OR isometric OR aerobic OR treadmill OR running OR "muscular endurance" OR "muscular strength" OR recovery OR sleep; Outcome concept: performance OR "perceived exertion" OR RPE OR "heart rate" OR "sleep quality" OR endurance OR "time to exhaustion".

Example search string: (music* OR "preferred music" OR "music tempo") AND (exercise* OR "resistance training" OR isometric OR aerobic OR recovery OR sleep) AND (performance OR "perceived exertion" OR "sleep quality" OR endurance).

No language or study-design filters were applied during the initial database searches. Eligibility was assessed during screening.

Eligibility criteria

Eligibility criteria were structured around the population, concept, and context relevant to the review.

Inclusion criteria

Inclusion criteria include, human participants; a music intervention (any genre, tempo, or preference condition) compared against a no-music, silent, white-noise, usual-care, or alternative-music control; a randomised or experimental design; at least one outcome on exercise performance (strength, endurance, power, or distance), perceived exertion, psychological response, physiological recovery, or sleep; and Published in a peer-reviewed journal in English.

Exclusion criteria

Exclusion criteria include non-human or purely theoretical studies; narrative reviews, commentaries, conference abstracts, and unpublished work; studies with no control or comparison condition; Music combined with other interventions (for example, video or caffeine) so that the

effect of music could not be isolated; and Studies with no full text available.

Screening and selection

Records retrieved from the databases were compiled, and duplicates were removed using Rayyan. Titles and abstracts were screened against the eligibility criteria, followed by full-text assessment of potentially relevant records. Reasons for exclusion at the full-text stage were documented. Two independent reviewers conducted screening, with disagreements resolved by a third reviewer. Studies identified through manual reference-list screening were also assessed for eligibility. The selection process was summarised using a PRISMA flow diagram, reporting the numbers of records identified, duplicates removed, records screened, full texts assessed, studies excluded, and studies included in the final review.

Data extraction

Information extracted from each study for analysis and presentation in a standardised format includes: first author and date; country; sample size and population; study design; exercise task; music condition (preferred, self-selected, motivational, stimulative, sedative, and other conditions); tempo when applicable; performance measures; RPE; psychological measures; key finding; and a PICO (Population, Intervention, Comparison, Outcome) summary. Data were extracted by the lead author and verified by another reviewer.

Data analysis and synthesis

Studies were organised into four domains: resistance exercise; isometric and handgrip exercise; aerobic exercise and acute recovery; and sleep. Cross-domain patterns relating to music preference, tempo, arousal and participant characteristics were also examined. Given the heterogeneity of study designs, interventions, populations, and outcome measures, no quantitative meta-analysis was undertaken. The synthesis was intended to map the available evidence and identify research gaps rather than estimate a pooled treatment effect. A formal risk-of-bias assessment was not undertaken.

RESULTS

The database search identified 1,452 records. After removing 386 duplicates, 1,066 records were screened by title and abstract, and 954 were excluded. 112 full-text articles were assessed for eligibility, and 85 were excluded, for the following reasons: wrong intervention (32), no control group (28), wrong outcome (14), and non-English (11). A further 3 studies were identified through reference-list searching. The final set comprised 30 studies, all of which are included in the synthesis (Figure 1).[10]

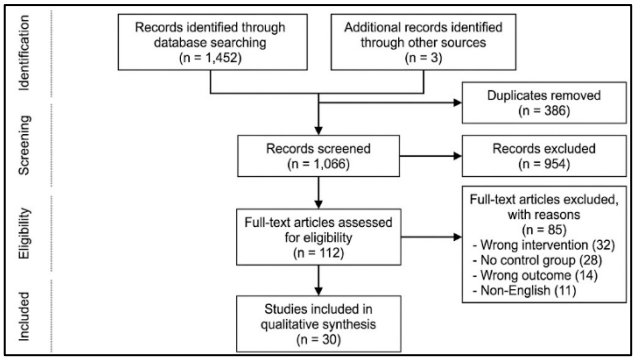


Figure 1: PRISMA-SCR flow diagram: Identification (1,452 records), duplicates removed (386), screening (1,066), full-text assessment (112), included (n=30).

Characteristics of included studies

The 30 included studies were published between 1981 and 2021 and came from the USA (8), the UK (7), Italy (2), Turkey (2), Brazil (2), Iran (2), Taiwan (2), and one each from the Netherlands, Switzerland, India, China and a Denmark/UK collaboration.[4-7,11-36] All were reported as randomised controlled trials, including one fMRI trial.[25] Together they enrolled 1,183 participants, with sample sizes ranging from 7 to 200 (the median study was small, at roughly 30 participants). Most samples were young, male, and either trained or university students. Exceptions were an older-adult sample of 153, a mixed-sex sample of 200 and clinical sleep samples.[6,7,23,34-36] By domain, 11 studies examined resistance exercise, 8 isometric or handgrip tasks, 7 aerobic exercise or acute recovery, and 4 sleep. Study details are in Table 1.

Resistance exercise

Eleven studies examined resistance exercise, with improvements in muscular endurance being the most frequently reported finding. Preferred music was associated with increased repetitions at 75% of 1-RM in trained men and a preferred warm-up track was associated with greater subsequent repetitions to failure and higher motivation.[11,12] Self-selected and motivational music were associated with increased repetitions at 60% of 1-RM, but did not change 1-RM strength in the studies that assessed both outcomes.[13,16] Similar endurance gains were reported across multi-set protocols, at low intensities across several genres and during lat-pulldown exercise.[15,17,18] At high loads of 80% of 1-RM, one small study involving seven trained men reported a 42% increase in repetitions.[21]

Evidence relating to explosive performance was more limited. Self-selected music was associated with increased take-off velocity and rate of force development in jump squats, alongside lower ratings of perceived exertion (RPE).[14] Findings for RPE were inconsistent: it was lower with music in some studies, whereas another study reported no change in RPE despite increased repetitions.[14,18,17]

Table 1: Characteristics and main findings of the included studies (n=30).

Reference	Study	Country	N / Population	Task	Music condition	Main finding
Resistance						
11	Ballmann et al, 2021	USA	12 trained men	Bench press, 75% 1-RM	Preferred vs non-preferred	Most reps, velocity, power and motivation with preferred music
12	Ballmann et al, 2020	USA	10 trained men	Bench press, 75% 1-RM (warm-up music)	Preferred vs non-preferred warm-up	Preferred warm-up music improved reps to failure and motivation
13	Bartolomei et al, 2015	Italy	31 trained men	1-RM and 60% 1-RM bench press	Self-selected vs none	Endurance improved; maximal strength unchanged
14	Biagini et al, 2012	USA	20 trained men	Bench press and squat jump	Self-selected vs none	Higher take-off velocity and rate of force development; lower RPE
15	Cutrufello et al, 2020	USA	15 active students	Bench press endurance, 5 sets at 70% 1-RM	Preferred vs none	More total repetitions with preferred music
16	Köse, 2018	Turkey	26 male students	1-RM and 60% 1-RM bench press	Motivational vs none	Endurance improved; 1-RM unchanged
17	Moss et al, 2018	UK	16 trained men	Reps to failure, bench press and squat	Several genres vs none	More reps at low intensity; higher vigor; overall RPE unaffected, but electronic dance music raised RPE and explosive power remained unchanged or was disadvantaged
18	Silva et al, 2021	Brazil	20 students	Handgrip and lat-pulldown endurance	Preferred vs non-preferred	Greater strength and endurance; lower RPE
19	Arazi et al, 2015	Iran	12 trained men	Resistance circuit	Music vs silent	Higher RPE, HR and blood pressure in silence
20	Brupbacher et al, 2014	Switzerland	13 trained participants	20-min CrossFit protocol	Unregulated music	Fewer total repetitions (ergolytic effect)
21	Meirelles et al, 2019	Brazil	7 trained men	Bench press to failure, 80% 1-RM	Preferred vs none	Repetitions up 42% with preferred music
Isometric and Handgrip						
22	Karageorghis et al, 2018	UK	52 male athletes	Handgrip	Tempo and loudness combinations	Peak force with fast, loud music
5	Karageorghis et al, 1996	UK	50 students	Handgrip	Stimulative (134 bpm) vs sedative vs control	Stimulative raised, sedative lowered force
4	Pearce, 1981	USA	49 students	Handgrip	Stimulative vs sedative vs none	Sedative music reduced grip strength

Continued.

Reference	Study	Country	N / Population	Task	Music condition	Main finding
23	Van den Elzen et al, 2019	Netherlands	153 older adults	Handgrip	Preferred vs disliked/none	Greatest grip strength with preferred music
24	Crust, 2004	UK	27 male students	Isometric weight-holding	Self-selected vs white noise	Longer time to failure with self-selected music
25	Bigliassi et al, 2018	UK	19 healthy adults	Handgrip (fMRI)	Music vs none	Dissociative attention and affective-arousal networks engaged
26	Feiss et al, 2021	USA	63 young adults	Wall-sit and plank	Fast/slow tempo vs none	Longer holds, more dissociation and higher pain tolerance
27	Crust and Clough, 2006	UK	58 active participants	Isometric shoulder raise	Motivational vs rhythm only	Longer time to maintain MVC with motivational music
Aerobic exercise and recovery						
28	Jones et al, 2017	UK	13 male runners	HIIT with passive recovery	Fast/slow tempo vs none	Higher affective scores in recovery with fast tempo
29	Archana et al, 2016	India	30 participants	15-min cycling	Preferred vs none	Lower absolute heart rate; autonomic balance (HRV) monitored
30	Köse and Atli, 2019	Turkey	35 male students	Bruce treadmill test	Fast vs slow tempo	Best performance with fast tempo; lowest post-recovery lactate with slow
31	Patania et al, 2020	Italy	19 active people	Treadmill walk and leg press	Medium vs high tempo	Lower RPE in both modalities
32	Ghaderi et al, 2009	Iran	30 male students	Submaximal run to exhaustion	Motivational vs relaxation	Greatest distance (motivational); lowest RPE and cortisol (relaxation)
33	Cole and Maeda, 2015	USA	35 undergraduates	12-min Cooper test	Preferred vs non-preferred	Better running performance in females
34	Dyrlund et al, 2008	USA	200 healthy people	20-min treadmill run	Favorite vs non-preferred	Small but significant gain in enjoyment
Sleep						
35	Su et al, 2013	Taiwan	28 ICU patients	Nocturnal sleep	Sedating music vs usual care	Better subjective and objective sleep; relaxation indices
7	Jespersen et al, 2019	Denmark/UK	57 adults with insomnia	3-week bedtime listening	Bedtime music vs treatment as usual	Shorter sleep-onset latency; better sleep efficiency
36	Gao et al, 2020	China	33 young adults	20 min pre-bed over 6 days	SWS brain-wave music vs white noise	Sleep efficiency improved only with SWS music
6	Chang et al, 2012	Taiwan	50 adults with insomnia	Polysomnography	Sedating music vs none	Shorter sleep latency; longer total sleep time

In a resistance circuit study, heart rate and blood pressure were higher in the silence condition.[19] Conversely, one study found fewer total repetitions during a CrossFit protocol with unregulated music, suggesting that the reported effects of music may vary according to the exercise task and music condition.[20] Overall, the included studies more frequently reported improvements in submaximal muscular endurance than in maximal strength, while findings for RPE and physiological responses varied across studies.

Isometric and handgrip exercise

Eight studies examined isometric and handgrip tasks, investigating outcomes related to maximal force and isometric endurance. For maximal force, the music's arousal quality mattered. Stimulative music raised grip strength while sedative music lowered it, and fast, loud music produced the highest peak force in a study that manipulated tempo and volume together.[4,5,22] Preferred music also increased grip strength in a large older-adult sample.[23]

For isometric endurance, several studies reported longer task duration with music. Self-selected music outperformed white noise in a weight-holding task and motivational music with lyrics outperformed rhythm alone.[24,27] Fast and slow tempi both extended wall-sit and plank holds, alongside greater dissociation and pain tolerance.[26]

A neuroimaging study supports a mechanism: music during grip exercise engaged networks linked to dissociative attention and affective arousal.[25] These findings illustrate the range of outcomes investigated in relation to music during isometric exercise, although differences in tasks and music conditions limit direct comparisons across studies.

Aerobic exercise and acute recovery

Seven studies examined aerobic exercise and acute recovery, including high-intensity interval training (HIIT), cycling, treadmill testing, treadmill walking, and submaximal running.[28-34] The interventions included fast- and slow-tempo music, preferred and non-preferred music, motivational and relaxation music, and different tempo conditions.

The studies investigated a range of performance, perceptual, affective, and physiological outcomes. The reported findings varied according to the music condition and exercise context, and differences in study designs and outcome measures limit direct comparisons across studies.

Sleep

Four studies examined music interventions for sleep across clinical and non-clinical populations. Sedating music improved subjective and objective sleep quality in ICU patients, shortened sleep latency and increased total sleep time in adults with chronic insomnia assessed by polysomnography and over three weeks of bedtime listening, shortened sleep-onset latency and improved sleep efficiency.[6,7,35] A brain-wave music intervention that translated slow-wave sleep EEG patterns into sound improved sleep efficiency only in the experimental group, not in a white-noise control group.[36]

The included studies varied in participant populations, music interventions, comparators, and sleep outcomes. Although improvements in some sleep-related measures were reported, these findings should be interpreted within the populations studied and should not be generalised directly to athletes or post-exercise recovery.

DISCUSSION

Patterns in muscular endurance and maximal strength

Across the included studies, improvements were reported more frequently for muscular endurance than for maximal strength. Where studies measured both, repetitions at submaximal loads improved while 1-RM did not.[13,16] The same split appears in isometric work, where time to exhaustion lengthened with music.[24,26,27]One explanation is that submaximal endurance tasks are limited partly by perceived effort and discomfort, which music can reduce through dissociation.[1,2,26] Maximal strength tests are brief and may be limited more by neuromuscular capacity. This reading fits the fMRI evidence of dissociative and affective networks and the meta-analytic finding that music's clearest benefits are on affect and perceived exertion.[25,3] However, differences in study designs and outcome measures mean that this pattern should be interpreted as a trend in the available evidence rather than a definitive difference in effectiveness.

Music tempo, arousal and variation in outcomes

The findings suggest that music characteristics may be associated with different outcomes depending on the task and context. Stimulative, fast and loud music improved force, and sedative music reduced it.[4,5,22] The same dimension separates performance from recovery. Fast tempo favoured treadmill performance, while slow tempo and relaxation music favoured lower lactate, RPE, and cortisol.[30,32] The sleep trials, which used sedating music, point the same way.[6,7,35] Taken together, the data fit an arousal-regulation account in which the musical stimulus should be matched to the goal: up-tempo for performance, calming for recovery and sleep.[1,2] These findings are compatible with the proposed role of arousal regulation, but they do not establish that a particular tempo is universally preferable for performance, recovery or sleep.

Music preference and individual responses

Preferred or self-selected music was repeatedly superior to non-preferred music, white noise, or silence.[11,12,23,24] Motivational music with lyrics outperformed rhythm

alone, which suggests that personal and lyrical meaning contributes beyond tempo.[27] Preference also shaped enjoyment and the benefit held in an older-adult sample although only one large study tested that group.[34,23] Although these findings suggest that individual preference may be relevant to responses to music, the available studies do not establish its independent contribution across exercise domains. Evidence concerning differences by age and other participant characteristics remains limited.

Task complexity and potential limitations of music

One study reported fewer total repetitions during a CrossFit protocol with unregulated music.[20] This finding contrasts with the improvements reported in several resistance-exercise studies and suggests that outcomes may vary according to task demands and the music condition. One possible explanation is that music may compete with the attentional demands of complex, multimodal exercise; however, this remains a hypothesis rather than an established mechanism. Because this observation came from a single small study, further research is needed to determine whether task complexity, music selection, or other study-specific factors contributed to the result.

Perceived exertion and performance outcomes

Findings for ratings of perceived exertion (RPE) were inconsistent. RPE fell with music in several studieswas higher in silence in another and was unchanged in one that still showed a performance gain.[14,18,31,19,17] Performance improvements therefore do not always depend on lower RPE. RPE may also be less sensitive at low or very high intensities, and its measurement differed across studies.

These findings indicate that changes in performance and perceived exertion do not necessarily occur together. Differences in exercise intensity, task duration, measurement approaches, and music conditions may contribute to the variation across studies. The available evidence does not establish a single explanation for these inconsistencies.

Participant characteristics and evidence gaps

One study reported greater running-performance benefits among females listening to preferred rather than non-preferred music, while another found favourable grip-strength outcomes with preferred music in older adults.[33,23] However, these observations come from individual studies and should not be interpreted as evidence of consistent differences by sex or age. Further research involving more diverse populations is needed to establish whether responses differ according to age, sex, training status, or other participant characteristics.

Music, sleep and recovery

The four sleep studies involved clinical or non-clinical populations, including patients in an intensive care unit, adults with insomnia, and young adults.[6,7,35,36] Their findings concerned sleep-related outcomes rather than direct measures of post-exercise recovery in athletes. Although the reported improvements in selected sleep outcomes provide a rationale for investigating music as a potential component of recovery strategies, they cannot be directly generalised to athletic populations. Trials examining sleep and recovery outcomes in trained athletes are needed to determine whether music interventions produce similar effects in these contexts. Overall, the evidence mapped in this review spans muscular endurance, maximal force, perceived exertion, aerobic performance, acute recovery, and sleep. The findings suggest potentially relevant relationships between music characteristics, task demands, participant preferences, and measured outcomes. However, the diversity of study populations, interventions, and outcome measures, together with the limited evidence in some domains, highlights the need for further targeted research.

Strengths of the review

This scoping review maps experimental evidence on music interventions across four domains: resistance exercise, isometric and handgrip exercise, aerobic exercise and acute recovery and sleep. Its strengths include the inclusion of diverse exercise tasks, music conditions, participant populations, and outcome measures, enabling comparisons of reported findings across contexts. The review also highlights variations in outcomes, including inconsistent findings for maximal strength and perceived exertion, and identifies evidence gaps relating to participant diversity, complex exercise tasks, and sleep and recovery in athletic populations. By mapping these domains together, the review provides a foundation for identifying priorities for future research and more focused evidence syntheses.

Limitations

Limitations of the included evidence. Many studies had small sample sizes. Tempo was not reported in many resistance and isometric studies, limiting comparisons of tempo with music preference and other intervention characteristics. Music conditions as well as different genres and exercise tasks varied considerably across studies, limiting direct comparisons of findings. Several studies were published decades ago and the sleep studies involved clinical or non-clinical populations rather than specifically examining sleep and recovery in athletes.

Limitations of this review, although the review used a structured search and selection process, the findings should be interpreted in light of the review methods and eligibility criteria. No formal risk-of-bias assessment was performed, and the synthesis was descriptive. Only English-language, peer-reviewed publications were included. The possibility of publication bias cannot be excluded. The grouping of studies into four domains was a pragmatic approach, and some studies addressed outcomes relevant to more than one domain.

Future directions and recommendations

Future studies should systematically measure and report music tempo, volume, and participant preference; recruit larger and more diverse samples, including women and older adults; investigate music during complex and multimodal exercise tasks; and examine sleep and recovery outcomes directly in athletic populations. These priorities may help clarify how music interventions relate to performance, recovery, and sleep across different populations and contexts.

CONCLUSION

This scoping review mapped 30 studies investigating music interventions across exercise performance, acute recovery, and sleep. Improvements in muscular endurance and isometric task duration were frequently reported, while findings for maximal strength, perceived exertion, and physiological responses varied. Evidence concerning sleep and recovery was limited in athletic populations. Further well-designed studies are needed to clarify how music characteristics, individual preferences, and task demands influence outcomes across these domains.

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