

Let the Music Play: Exploring the Relationship Between Music Listening, Self-Esteem, and Subjective Vitality During Exercise Among College Students

Nina Adjanin^{1*} , Ilina Arsova² , Rhonda Cross Beemer¹ , Tina Gaa Pulley¹ ,
Gordon P. Brooks³ 

¹ Northwest Missouri State University, Maryville, US

² University of Tennessee, Knoxville, US

³ Ohio University, Athens, US

* Correspondence: adanin@nwmissouri.edu; +1 740 818 7527

ABSTRACT

Background: College students often experience heightened stress and mental health challenges. Previous research has suggested that physical activity and music can independently enhance subjective vitality (e.g. psychological well-being) and self-esteem. The purpose of this study was to determine to what extent music impacts college students' subjective vitality and self-esteem while exercising in a gym or outside through the lens of Self-Determination Theory (SDT).

Methods: A quantitative, observational, cross-sectional survey was conducted to investigate the impact of music on college students' subjective vitality and self-esteem while exercising either in a gym or outdoors. A total of 200 college students completed an online survey measuring constructs related to SDT, self-esteem, and subjective vitality. The proposed model tested seven hypotheses regarding direct and indirect relationships between SDT variables, self-esteem, and subjective vitality.

Results: The model explained 56.8% of the variation in self-esteem and 56.2% in subjective vitality. Autonomy and competence demonstrated significant direct effects on subjective vitality and indirect effects mediated by self-esteem. Relatedness influenced subjective vitality indirectly through self-esteem. Significant differences were found between gym and outdoor exercisers, with gym users reporting higher self-esteem and subjective vitality scores. No significant differences were identified between genders.

Conclusion: Music positively influences college students' self-esteem and subjective vitality as psychological well-being during exercise, supporting the application of SDT in this context. Enhancing these psychological outcomes through music-assisted exercise routines may contribute to students' mental and physical health, academic performance, and personal development.

Keywords: students, music, exercise, self-esteem, subjective vitality, Self-Determination Theory

1. INTRODUCTION

An innovative workout routine that incorporates music is rapidly gaining popularity on college campuses worldwide, enhancing motivation, mood, and athletic performance (Andreeva & Karanauskienė, 2017; Jebabli et al., 2023). By integrating a thoughtfully curated playlist, this approach not only fosters a

rhythmic flow but also contributes to improved athletic outcomes, helping individuals achieve higher levels of physical performance. Music has increasingly been integrated into many aspects of sports, including a variety of sports events as well as daily training routines (Terry et al., 2020). For instance, it is hard to imagine Olympic



medal ceremonies without music, and sports like gymnastics and ice skating rely heavily on music as a central element of the competition itself. In fact, certain songs have become symbolically tied to specific sporting moments, reinforcing music's status as a core phenomenon in athletic culture (Bateman & Bale, 2008). With a new technology that is more acceptable and affordable, especially personal audio technology, many people are using their own music while exercising and participating in some sport activities. This trend is especially recognised among younger generations, such as college students. This growing trend highlights the importance of understanding how music not only shapes students' exercise experiences but also supports their psychological well-being by boosting mood, motivation, and feelings of social connection.

Integrating Self-Determination Theory (SDT) (Deci & Ryan, 1985) with the role of music as a *contextual factor* in exercise offers insight into how workouts can become more satisfying and effective, with important benefits for mental health. A sense of personal control plays a crucial role in shaping students' motivation and overall well-being. When college students feel they have control over their success in academics or sports, they tend to be more motivated, experience belonging, and achieve positive outcomes (Assor et al., 2002; Froiland et al., 2016; Gao et al., 2024). Thus, individuals are motivated to engage in activities when they feel a sense of autonomy, competence, and relatedness in those activities. According to SDT (Deci & Ryan, 2000), satisfaction of basic psychological needs – autonomy, competence, and relatedness – is essential not only for subjective vitality (e.g. psychological well-being) but also for fostering positive self-esteem. Furthermore, individuals are most motivated when their basic psychological needs – autonomy, competence, and relatedness – are satisfied. Meeting these needs supports subjective vitality, a state of feeling alive and energised, which is a key aspect of psychological well-being, as well as fostering positive self-esteem (Howard et al., 2025).

The most common place where students engage in physical activities outside of classes is in a gym setting, where listening to music can enhance the experience of autonomy by allowing individuals to make their own choices about the music they listen to while they exercise (Priest et al., 2004). At the same time, music can enhance feelings of competence by providing a sense of mastery and control over the workout experience. Music and rhythm can also boost feelings of relatedness by connecting

individuals with others who share similar interests and preferences in music, something that has been evident throughout history (Ballmann, 2021). By supporting these three psychological needs, music contributes to a more fulfilling and mentally healthy exercise experience. Additionally, music has been shown to reduce stress and anxiety, which are significant contributors to poor mental health among students (Terry et al., 2020). As Bray and Born (2004) observe, participation in sports and physical activity evolves over the lifespan and can be affected by major life transitions. Thus, understanding what motivates college students to stay committed to their exercise routines is essential.

Empirical research has consistently shown that higher satisfaction of these psychological needs predicts greater self-esteem and psychological well-being across various domains, including exercise (Reis et al., 2000; Ryan & Deci, 2001). In exercise settings, music can support these needs by offering personal choice, enhancing perceived competence through rhythmic synchronisation and mood regulation, and encouraging social connection, which in turn promotes both subjective vitality and self-esteem. Subjective vitality refers to the feeling of being alive, alert, and energised and is considered a central element of eudaimonic well-being (Ryan & Deci, 2001). Furthermore, different exercise environments such as gyms versus outdoor spaces may offer distinct opportunities to satisfy autonomy, competence, and relatedness, potentially influencing how music affects psychological well-being.

This study contributes to the limited literature at the intersection of music, SDT, and college students' workout experiences by specifically examining the mediating role of perceived competence, autonomy, and relatedness in the relationship between music listening and both subjective vitality and self-esteem. Additionally, it explores whether the exercise location (gym versus outside) affects these relationships. By investigating these factors, this study aims to deepen our understanding of how music can be strategically used to promote psychological well-being and positive mental health outcomes among college students.

Music, exercise, and sport

A dyadic relationship exists between music and physical activity that can be traced back to the athletic games played by the ancient Greeks (Hohler, 1989). There are hundreds of fables, legends, and annals of history that depict the power of music to command both the mind and the body

(Karageorghis, 1998). Meglic et al. (2021) studied the effect of preferred vs. non-preferred music on sprint times in 14 NCAA (National Collegiate Athletic Association) Division I women's track athletes. They found that preferred music improved sprint performance and motivation. Furthermore, listening to music before high-intensity exercise may aid in better performance for athletes. On the other hand, researchers from Germany studied how music affects vertical jump performance in 13 male volleyball players aged 25–28. They tested relaxing music, self-selected stimulating music, and no music, measuring box jumps with a force plate and mood with a questionnaire. The study found no improvement in performance with music and concluded that more research is needed to establish the guidelines for music use in elite athletes (Gavanda et al., 2022). Moreover, researchers from universities in China studied how music affects training in novice dart throwers, measuring heart rate and performance. Participants were assigned to slow music, fast music, or control groups. After pre-tests, practice, and post-tests, results showed that throwers performed better with slow-paced music (Tso et al., 2022). Rebadomia et al. (2019) studied the effect of wave-synchronised music on the performance of six collegiate throwers (3 males and 3 females) in shot put, discus, and javelin. Over 11 days, athletes performed better with music synchronised at 12 Hz, compared to 0.5–3 Hz, which hindered performance. Motivation is a crucial component of this process. Traditionally, it is defined as the intensity and direction of an action (Sage, 1977).

Music in fostering self-esteem and motivation in physical activity

Self-Determination Theory (SDT), initially developed by Deci and Ryan (1985), focuses on the reasons behind actions rather than their intensity. SDT emphasises that motivation quality varies along a continuum-based polar opposites between autonomous motivation (driven by personal interest or values) to controlled motivation (driven by pressure or obligation) (Manninen, 2022). Controlled motivation may be either seduced, threatened or coerced, and/or pressured into behaving. When motivation is controlled, people tend to take the shortest path to desired outcomes with negative consequences for performance and well-being. With autonomous motivation, people experience full volition, willingness, and choice about what they are doing, basically endorsing the behaviours. When autonomous, a person is genuinely interested

and enjoys the activity, deeply values the activity, and is fully willing to take action. Autonomous motivation enhances creativity, problem solving, and innovative thinking, while also improving performance and fostering positive emotion linked to both physical and mental health. Therefore, listening to music during exercise can serve as a need-supportive tool, offering a practical SDT-based intervention that helps college students experience well-being, a sense of flourishing, and greater control over their lives. In regard to motivation, it is important to note that controlled and autonomous motivation originated from early research on intrinsic (IM) or extrinsic (EM) motivation (Ryan & Deci, 2012).

Intrinsic represents autonomous motivation at the end of the continuum, whereas extrinsic represents movement towards controlled motivation. A person who is motivated by intrinsic reasons will engage in an activity just for the sake of engaging in it, for the enjoyment that can be derived from participating. IM actions occur in the absence of external rewards, acting out of interest due to curious engagement to better understand one's self-development, leading towards more IM. IM actions are challenging but not so challenging that one does not feel progress and/or mastery when needs for autonomy and competence are supported and connectedness and belonging is experienced. On the other hand, the goal of extrinsically motivated behaviour is, as the name implies, to achieve a goal that is external to the activity itself. In the example of extrinsic motivation, a person playing sports to achieve social status might be considered to be extrinsically motivated. Adding to this dynamic, activities like listening to music or engaging in exercise can play a significant role in both intrinsic and extrinsic motivation. Being extrinsically motivated in an autonomous way is possible; therefore, EM can become internalised as one finds values and/or chooses to continue the behaviour. For example, if a student dreads walking to class but chooses to listen to their favourite music on the way, they might find the walk more enjoyable. Over time, the act of listening to music during this routine could become important and valued.

Goodenow (1993) defines relatedness as the gold standard where students sense that they are "accepted, respected, included, and supported by others" (p. 80). Today, the majority of students, while they exercise, are listening to their own music which can be seen as distancing from other people and focusing on their own work (Karageorghis &

Priest, 2012). According to Deci and Ryan (1985, 2000), individuals with a high sense of autonomy believe they have control over the ways in which they work towards completing a task, in this case, successfully achieving an exercise goal. The third segment of SDT is competence, which has been playing an important role in sports and physical activity. When a college student has a sense of competence, he/she believes that they possess the resources and/or skills that are necessary to succeed in a task they are working towards accomplishing (Deci & Ryan, 1985, 2000). However, the sense of competence directly influences self-esteem, as individuals who feel capable and skilled are more likely to have a positive self-assessment and greater psychological well-being.

Social factors influence both the promotion and limitation of flourishing across different domains of activity, depending on whether the three basic psychological needs (autonomy, competence, and relatedness) are satisfied. Whether individuals are aware of these needs or not, they are fundamental to psychological growth, well-being, and overall flourishing. Importantly, even when individuals do not consciously value a particular need, not having it met can still negatively affect their well-being and personal growth. Therefore, listening to music while exercising may be a means for college students to experience flourishing, well-being, and vitality even if one does not value exercise. Concerning the contextual level, music has been established as a ubiquitous factor within the context of the facility-based exercise experience. Hence, music may contribute to contextual motivation and, by extension, global motivation (having both extrinsic and intrinsic motivation). The behavioural effects of motivation promoted by music at the contextual level might include increased exercise adherence (Karageorghis, 1998).

Research suggests that, for most, volition and wellness, when relatedness, competence, and autonomy needs are met, lead towards well-being (Ryan & Deci, 2017). Well-being represents a broader perspective of wellness and physical activity to include satisfaction, life quality, and vitality (Logan et al., 2023). Vitality plays a key role in physical health, wellness, well-being, mental health, energy, high self-esteem, and embracing life-giving activities. With physical activity, the transition from eudemonic well-being (enjoyable) towards a hedonic well-being (good for you) mindset and finding ways to promote and engage others in physical activity is necessary and allows for a broader accomplishment

of well-being and vitality. Positive outcomes across physiological, psychophysical, psychological, and performance research studies of athletes and exercisers are proving to connect listening to music while exercising as an affective need supporter (Terry et al., 2020). Within three 30 min exercise sessions Tsai et al. (2023) connected significant findings on self-selected music that enhances performance of working memory, lowers rate of perceived exertion, and increases exercise enjoyment. Furthermore, Ryan and Deci (2008) suggest that focusing on autonomous tasks as well as fulfilling autonomy, competence, and relatedness may lead one towards vitality, energy, and overall life satisfaction rather than ego based, extrinsic lifestyle endeavours and controlling behaviours. Listening to music while exercising has proven to serve as a need supporter with the potential to assist task internalisation to move one through the SDT continuum while increasing self-esteem.

Self-esteem is a crucial element of a person's subjective vitality, a key component of psychological well-being and refers to how much someone values and appreciates themselves through means of self-assessment (Rosenberg, 1965). High self-esteem is a core trait of a well-adjusted young adult that can help to prevent many threats, such as depression, suicide, and relationship difficulties (Grocott & Hunter, 2009). Similar to motivation, many factors can impact the constantly shifting nature of self-esteem. Therefore, in any endeavour to promote positive young adult development, an increase in self-esteem should be the desired outcome. Self-esteem is frequently mentioned in the literature as a trait that benefits from participating in sports. Given the importance of self-esteem in young adult development and its connection to subjective vitality, understanding the factors that influence it is critical. In this context, both exercise and music have been identified as potential contributors to enhancing self-esteem and psychological well-being. This study aimed to examine the influence of listening to music during exercise on college students' self-esteem and subjective vitality, with a focus on key psychological needs in the context of listening to music (autonomy, competence, and relatedness). Additionally, the study investigated how the exercise location (gym versus outside) may affect these relationships.

Building on established measurement scales, the study aimed to test several hypotheses on the relationship between key psychological factors and student subjective vitality (a component of

psychological well-being) in the context of listening to music during exercise. Furthermore, listening to music during exercise is conceptualised as a key contextual factor that shapes individuals' psychological experiences and outcomes. Rather than treating music as a manipulated independent variable, we examined how naturally occurring music engagement during exercise relates to satisfaction of basic psychological needs of autonomy, competence, and relatedness and subsequent effects on self-esteem and subjective vitality. This approach recognises music as an embedded element in the exercise environment that supports motivational processes consistent with SDT. Specifically, the following hypotheses were proposed to explore the direct effects of autonomy, relatedness, and competence

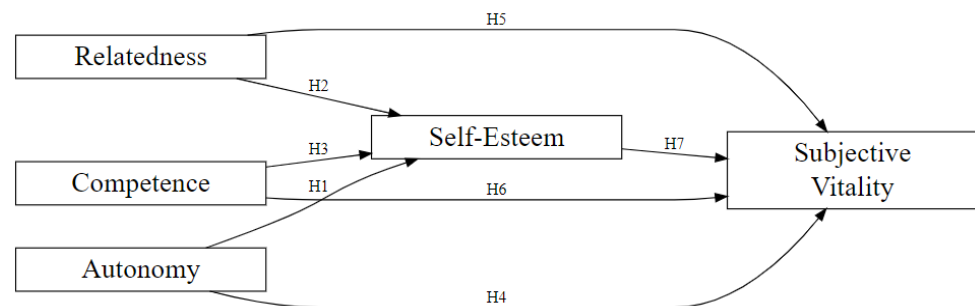
on both self-esteem and subjective vitality among college students engaging in gym workouts with music (Figure 1):

H1–H3: Feelings of autonomy, relatedness, and competence while listening to music each have a significant positive direct effect on college students' self-esteem during gym exercise with music.

H4–H6: Feelings of autonomy, relatedness, and competence while listening to music each have a significant positive direct effect on college students' subjective vitality during gym exercise with music.

H7: Self-esteem has a significant positive direct effect on college students' subjective vitality (psychological well-being) during gym exercise with music.

Figure 1. **Proposed model**



2. METHODS

This study used a quantitative, observational, cross-sectional survey design to investigate the effects of music on students who listen to music while exercising. The primary aim was to explore the relationships between music listening during exercise and psychological factors such as self-esteem, subjective vitality, and emotional responses, using path analysis. In this study, music listening during exercise is treated as a contextual factor that shapes participants' psychological experience during physical activity. The focus is on understanding how this context relates to basic psychological needs satisfaction, self-esteem, and subjective vitality.

Participants were selected as full-time college students enrolled at one higher education institution. Using a voluntary sampling technique, students were invited to participate in a voluntary and anonymous online survey created by the researchers via online Microsoft Forms. Participants completed the survey based on their typical experiences exercising while listening to music, allowing us to assess associations between music-contextualised

exercise and psychological variables. Recruitment was conducted through multiple channels, including posts on student social media groups (e.g. Facebook, Instagram), Canvas announcements, and university email lists specifically targeting full-time students who met the inclusion criteria, such as 18 years or older and had a status of full-time students. The study received ethical approval from the Northwest Institutional Review Board (IRB), with Approval Code: 2223-034, during the spring semester of the 2024 school year. A total of 200 university students completed the survey. Due to the design of Microsoft Forms, only fully completed forms were recorded and saved. Therefore, we do not have data on the number of students who started but did not finish the survey. This approach ensured the completeness of data used for analysis, but limited insights into response dropout rates.

Instrument development

The scales used in the present study were adapted from existing scales. To assess the influence of music on relatedness, competence, autonomy, and self-esteem on the overall well-being of college

students, a combination of multiple regression and correlation analyses was conducted following a reliability check of Cronbach's alpha using SPSS and Jamovi software.

Basic Psychological Needs Scale. To assess motivation in line with Self-Determination Theory, the study employed an adapted version of the Basic Psychological Needs Scale (Deci & Ryan, 1985, 2000), tailored for exercise contexts, similar to scales such as the Psychological Need Satisfaction in Exercise Scale (Wilson et al., 2006). This 21-item questionnaire measures the satisfaction of autonomy, competence, and relatedness needs on a 5-point Likert scale with 1 (Never) to 5 (Always). The adaptation ensured relevance to music listening during exercise while maintaining the scale's established validity and reliability. Example of competence question: [I feel confident in my abilities to accomplish tasks when I listen to music.], followed by autonomy: [I feel like I am able to make choices that are important to me in a gym.], and relatedness: [I feel close to the people around me even if we all have earphones.].

Subjective Vitality Scale. The 7-item questionnaire was designed by Ryan and Frederick (1997), which captures an individual's sense of aliveness and energy, a core component of psychological well-being. It was used in this study to investigate overall perceptions of mental and physical agility and energy (Bostic et al., 2000). It comprises a 7-item scale where items were measured on 5-point Likert scale ranging from 1 (Never) to 5 (Always). One of the questions that we asked was: [I feel alive and vital when I listen to music while I exercise.].

Rosenberg Self-Esteem Scale. The 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used to assess individuals' self-esteem. The items were rated on a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The overall self-esteem score was calculated by the average of the items' scores, and the negatively worded items were reverse scored. The internal reliability of the scale has been reported in previous research (e.g. Bylsma et al., 1997). Some of the questions: [When I'm listening to music, I feel that I am a person of worth, at least on an equal basis with others.] and [When I listen to music in a gym, I take a positive attitude towards myself.].

Several measures were implemented to minimise potential sources of bias. First, participant recruitment was conducted through social media groups, Canvas announcements, and university emails to reach a diverse sample of full-time college students at one university. Second, the online

survey was anonymous to reduce social desirability bias and encourage honest responses. Third, validated and reliable scales were used to measure key constructs, ensuring consistency and accuracy in data collection. Finally, only fully completed surveys were included in the analysis to avoid missing data bias. Despite these efforts, the voluntary nature of participation may introduce self-selection bias, which is acknowledged as a limitation of this study.

Our path model included 15 estimated parameters, and with a sample size of 200 participants, we exceeded the commonly recommended minimum participant-to-parameter ratio of 10:1 for path analysis (Kline, 1998). Based on this guideline, a minimum sample of 150 participants would typically be advised for a model of this size. A sample size of 200 also exceeded the recommendation from G*Power 3.1.9.7 for the key four-predictor regression of subjective vitality where 174 cases will provide power of .95 for a relatively small effect size of $R^2 = .15$. Further, Brooks and Barcikowski (2012) reported that with four predictors, precision efficacy of .70, and an R^2 effect size of .15, a sample size of 175 will provide stable results from the perspective of the precision of the estimates. Finally, G*Power recommended a sample size of at least 132 for testing a single regression coefficient within a four-predictor regression (Faul et al., 2009).

The data analysis started with an examination of the sample means, standard deviations, and distributions for each variable and demographic factor. Following this, correlation analyses were performed to identify any significant relationships between the variables. Path analysis was used to investigate the direct and indirect relationships between relatedness, competence, autonomy, self-esteem, and well-being, with a focus on understanding how these factors are affected by the music that students listen to while exercising. The findings of this study provide valuable insights into the potential determinants of student well-being, particularly in relation to the quantity of music students incorporate into their exercise and sports routines. Since Microsoft Forms only recorded and saved fully completed answers, we did not have the information on how many people started but did not finish the survey.

3. RESULTS

Two-hundred full-time university students in a single midwestern university in the US participated in this study. As a result, this study found that the majority of students (97%) prefer to listen to music

while exercising using headphones or smartphones. Of the 200 participants, 80.5% prefer to exercise in a gym, whereas 19.5% prefer to exercise outside. In terms of gender, 53.5% of participants identified as

female, while 46.5% identified as male. Additionally, 94% of participants were undergraduate students, and 6% were graduate students (Table 1).

Table 1. Descriptive statistics of the target population

Features		Population	Proportion (%)
Gender	Female	93	53.5
	Male	107	46.5
Educational background	Undergraduate	188	94
	Graduate	12	6
Location	Gym	161	80.5
	Outside	39	19.5

Most students expressed that listening to music significantly contributes to the perception of time passing quicker during their exercise sessions. On a Likert scale ranging from 1 to 5, where 1 represents the least agreement and 5 the highest, the average rating for this sentiment was recorded at $M = 4.38$ with $SD = 0.92$. This indicates a relatively strong consensus among the respondents regarding the time perception while listening to music during exercise. Furthermore, students, on average, engage in exercise sessions accompanied by music for approximately 4.4 days ($M = 4.4$, $SD = 1.67$) per week. When it comes to choosing music to listen to while exercising, 86.5% of students make their own playlists, while 12% prefer to listen to random music. At the same time, it has been found that 48.5%

of the people prefer to combine cardio with strength training, followed by 41% who chose strength training or resistance training as their preferred type of exercise.

Prior to conducting hypothesis testing, this study delved into descriptive statistics to gain insight into the data's distribution and the measures of interest. Directly measured variable scores can be found in Table 2. The reliability of the SDT variables, self-esteem and vitality satisfaction–well-being was observed for each of the scales. This study was pursued using Likert-type scales, and in that case, the highest score Cronbach's alpha is for competence with a 9-item scale ($\alpha = .94$), followed by a well-being 7-item scale ($\alpha = .92$).

Table 2. Descriptive statistics for direct measure factors

	N	Mean (SD)	Minimum	Maximum	Cronbach's α
Autonomy	200	4.52 (.54)	1.50	5.00	.842
Competence	200	4.34 (.69)	1.33	5.00	.949
Self-Esteem	200	4.45 (.67)	1.00	5.00	.867
Subjective Vitality	200	4.67 (.54)	1.83	5.00	.921
Relatedness	200	3.88 (.87)	1.00	5.00	.886

This study found that all variables were significantly correlated with one another (Table 3), and this indicates that there is a strong connection between them and an evident relationship. To explore potential connections between directly measured variables among college students, a Pearson's product-moment correlation analysis was carried out. The outcomes uncovered robust and statistically

significant positive relationships, particularly between competence and self-esteem ($r(198) = .731$, $p < .005$), and the lowest between autonomy and relatedness ($r(198) = .345$, $p < .005$). Partial plots among variable pairs were used to inspect the existence of homoscedasticity. This strong correlation suggests a noteworthy association between these two variables among the sampled students.

Table 3. Correlational matrix between factors

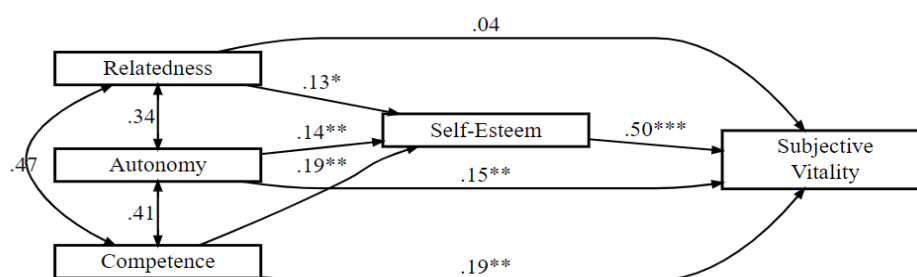
	1	2	3	4
Autonomy				
Competence	.414**			
Self-Esteem	.434**	.731**		
Subjective Vitality	.460**	.634**	.718**	
Relatedness	.345**	.467**	.461**	.408**

Note: ** = $p < .005$.

Path analysis. The path analysis examined relationships between psychological needs, self-esteem, and subjective vitality within the context of music-listening during exercise. In this study, we used path analysis, a form of structural equation modelling, to explore the relationships between variables. This approach is based on regression and helps identify how some variables mediate the

connections between others. The first model was created, reflecting the hypothesised model, using Jamovi 2.6.11. Model coefficients and fit indices were generated. A path analysis for the proposed model was constructed using variable autonomy, relatedness, competence, self-esteem, and well-being. Figure 2 represents hypothesised relationships between variables in the model.

Figure 2. Path diagram of the proposed model

Note: - = $p > .05$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

All seven hypotheses in this study were supported except for H5 (i.e. the Relatedness-Subjective Vitality relationship) (see Table 4 and Figure 2). In perceived relatedness towards subjective vitality, the study findings revealed that relatedness had no effect, so H5 was not supported. It explains 56.8%

of the variation in subjective vitality. After testing the proposed model, we removed the direct path from relatedness towards subjective vitality since we found that relatedness had mediation through self-esteem on subjective vitality (Figure 3).

Table 4. Analysis of hypotheses

Hypothesis – Relation path	β	R^2	p
H1: Autonomy $\rightarrow$ Self-Esteem	.135	.018	.009**
H2: Relatedness $\rightarrow$ Self-Esteem	.126	.015	.018*
H3: Competence $\rightarrow$ Self-Esteem	.616	.002	.000***
H4: Autonomy $\rightarrow$ Subjective Vitality	.153	.003	.004**
H5: Relatedness $\rightarrow$ Subjective Vitality	.038	.003	.481
H6: Competence $\rightarrow$ Subjective Vitality	.190	.004	.007**
H7: Self-Esteem $\rightarrow$ Subjective Vitality	.495	.246	.000***

Note: - = $p > .05$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

Figure 3. Path diagram of the modified model

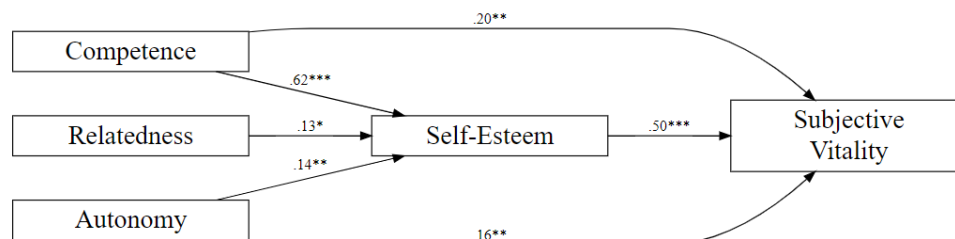


Table 5. Modified model table

Dependent	Predictor	Estimate	SE	β	z	p
Sub. Vitality	Competence	0.1552	0.0541	0.200	2.87	0.004
Sub. Vitality	Self-Esteem	0.4035	0.0563	0.504	7.16	<.001
Sub. Vitality	Autonomy	0.1576	0.0524	0.158	3.01	0.003
Self-Esteem	Competence	0.5981	0.0535	0.617	11.17	<.001
Self-Esteem	Relatedness	0.0967	0.0412	0.126	2.35	0.019
Self-Esteem	Autonomy	0.1681	0.0646	0.135	2.60	0.009

These results showed both direct and indirect effects for both autonomy and competence. Because the indirect effects were significant, there was evidence that self-esteem partially mediated the relationship between subjective vitality and both autonomy and competence (Table 5). The standardised indirect effect for competence was $\beta = .31$ ($p < .001$), and the standardised indirect effect for autonomy was $\beta = .07$ ($p = .015$). However, the relationship between relatedness and subjective vitality was fully mediated by self-esteem ($\beta = .06$, $p = .026$).

A set of t tests was conducted to compare college students who exercise in a gym versus those who exercise outside. The results indicate significant differences in the variables of autonomy, self-esteem, relatedness, and subjective vitality. Students who prefer to exercise in the gym ($M = 4.51$, $SD = .59$) compared to students who prefer to be outside ($M = 4.20$, $SD = .59$) demonstrated significantly better results in self-esteem ($t(198) = 2.72$, $p < .005$), and in subjective vitality ($t(198) = 2.74$, $p < .005$). However, there was no statistically significant difference between males and females and any of the studied factors.

4. DISCUSSION

Music has been shown to improve physical performance and psychophysical responses, lower perceived exertion, and contribute to a more enjoyable overall sporting experience (Terry et al., 2020). This study aimed to determine to what extent music impacts college students' vitality and self-esteem while exercising in a gym through the lens of motivation. According to Ryan and Deci

(2000), motivation refers to being "moved to do something" (p. 54). A study by Burger et al. (2012) examined how beat-related musical features influence the regularity of music-induced movement. This highlights the importance of understanding what motivates students during exercise and how this motivation affects their self-esteem and subjective vitality (e.g. psychological well-being).

Throughout the school year, coaches, teachers, and parents continue to work to improve the self-esteem of their students since it has been shown that higher self-esteem can improve grades, athletic abilities, and behaviour (Honório et al., 2024). Additionally, a growing body of evidence suggests that individuals who engage in regular physical activity and sports are less likely to experience depression, high stress, or behavioural issues (Ferron, 1999). This study also found that self-esteem played an important role in subjective vitality, a key element of psychological well-being among students while listening to music. The path from self-esteem had a positive effect on vitality, with a weight of 0.50. This relationship explained 56.8% of the variation in self-esteem and 56.2% of the variation in vitality.

Autonomy and competence had significant direct effects and indirect effects on vitality mediated by self-esteem. In sport, outcomes such as reduced dropout rates, greater enjoyment, and increased effort can be achieved by fostering autonomy through positive feedback, appropriately challenging tasks, and thought-provoking questions (Manninen et al., 2022). Meeting relatedness needs through open communication, genuine personal interest, and supportive strategies, including increased competence

through constructive feedback, helps create a safe and inclusive environment. This, in turn, enhances intrinsic motivation, self-esteem, and psychological well-being, in this case, subjective vitality (Collie et al., 2024). According to Ryan and Deci (2017), self-regulators represent indicators of autonomy and competence that need support. Therefore, creating your own exercise playlist and using that playlist while exercising can be considered a self-regulating activity. This helps people feel supported in their own lives, which is exactly what the Self-Determination Theory (SDT) approach aims to do. Relatedness had only an indirect positive effect on vitality, mediated by self-esteem. It is common that gyms are usually full of other people; exercising in a gym while listening to music is typically an individual activity where the focus is more on personal performance and physical exertion rather than social connection. While music can enhance mood, it may not foster interpersonal relationships in the same way as other social interactions (Deci & Ryan, 2002). Additionally, relatedness might influence vitality indirectly through other factors like self-esteem rather than directly affecting vitality (i.e. feeling alive, energetic, and enthusiastic) in this context (Liu et al., 2021). Furthermore, autonomy and competence, which are central to SDT, are likely more prominent in a gym setting, where students have control over their exercise routines and feel a sense of accomplishment (Teixeira et al., 2012). As a result, autonomy and competence may play a more significant role in shaping vitality during exercise than relatedness (Solberg et al., 2012). However, this finding supports previous studies, such as Karatzias et al.'s (2006), which highlighted the positive relationship between self-esteem, affectivity, and vitality.

Comparing college students who exercise in a gym versus outdoors showed significant differences in self-esteem and vitality, with gym exercisers reporting higher scores than outdoor exercisers. Students who prefer to exercise in the gym compared to students who prefer to be outside demonstrated significantly better self-esteem: $t(198) = 2.72$, $p < .005$, and vitality: $t(198) = 2.74$, $p < .005$. These findings are consistent with Barton et al.'s (2012), who also observed that different exercise environments, such as swimming or green exercise walks, had significant effects on participants' self-esteem and mood. Together, these results highlight the importance of the exercise setting in influencing psychological well-being among students.

Practical implications

This study's findings underscore the significant role that music can play in improving physical

performance, psychological responses, and overall exercise experience among college students. Specifically, integrating music into gym-based exercise routines appears to boost subjective vitality, a key indicator of psychological well-being and self-esteem, both of which are crucial for motivating sustained physical activity.

University wellness programmes and fitness initiatives can leverage these insights by encouraging students to create personalised exercise music playlists, thereby supporting their sense of autonomy and competence. Self-Determination Theory suggests that fostering psychological needs strengthens intrinsic motivation, subsequently promoting self-esteem and vitality during exercise. This suggests that music-integrated exercise interventions not only make physical activity more enjoyable but also contribute to better mental health outcomes. Moreover, given that autonomy and competence showed strong direct and indirect effects on vitality through self-esteem, fitness professionals and campus wellness coordinators should focus on strategies that provide positive feedback, challenging tasks, and opportunities for skill development within exercise programmes. These approaches can reduce dropout rates, increase enjoyment, and promote greater effort among students.

Relatedness, or the need for social connection, in this study showed a weaker direct impact on vitality during gym-based exercise. However, wellness programmes might still benefit from combining music-based exercise with group activities or social support networks to enhance social engagement and build a sense of community, such as *gym-wide fitness challenges* and *relay-style workouts*. Finally, the observed differences in self-esteem and vitality between students exercising in gyms versus outdoor settings highlight the importance of offering diverse exercise environments to meet varying preferences and psychological needs. Universities should consider designing flexible wellness initiatives that incorporate music-integrated programmes across different settings to maximise benefits for student mental and physical health.

Limitations and recommendations

This study focused exclusively on college students over the course of one academic semester, using online survey research methods. Future research could expand to include a broader population sample from the general public and consider different times of the year, especially seasons with more favourable weather that encourage outdoor

physical activity. A limitation of this study was the lack of diverse outdoor running spaces on the campus where the data were collected. This environmental constraint could be addressed in future studies by selecting settings with more varied and accessible outdoor exercise areas.

While this study examined the effects of music during exercise, it would be valuable for future research to investigate both the pre- and post-exercise effects of music in recreational and professional sports contexts. Exploring the integration of fitness technologies such as *Peloton*, *Strava*, and *Fitbit* could also offer insights into enhancing self-guided fitness programmes and the role of technology in exercise motivation and performance. Another consideration is the voluntary nature of participation, which may introduce self-selection bias. This limitation could be mitigated in future studies through strategies such as randomised sampling or offering incentives to encourage broader participation. Lastly, the sample size represents another limitation. Increasing the sample size in future research would improve the generalisability of the findings.

Additionally, since the study relied on self-reported online surveys, participants may have provided socially desirable responses or may have not accurately remembered their exercise and music habits. The cross-sectional design also limits the ability to establish causal relationships between music use and exercise experiences, as data were collected at a single time rather than longitudinally. The absence of experimental control over variables such as exercise environment, type of music, or fitness level further restricts the study's internal validity. Future research using experimental or longitudinal designs, with controlled conditions and objective measures, would strengthen the evidence base and offer a more comprehensive understanding of music's influence on physical activity behaviour.

5. CONCLUSIONS

This study highlights the meaningful role of music in enhancing college students' subjective vitality and self-esteem during exercise, framed within the Self-Determination Theory. These findings highlight the importance of students feeling in control of their workouts and confident in their ability to handle challenges, as this can positively affect their self-esteem and vitality. Although relatedness was not a strong direct factor towards vitality, it still played an important role indirectly by supporting self-esteem. As an affordable and accessible

strategy, integrating music into exercise routines offers a practical way to support student mental health and motivation. Students who preferred exercising in the gym with music demonstrated significantly higher self-esteem compared to those who preferred exercising outdoors. Future research should explore these effects across different exercise environments, diverse populations, and consider longitudinal or experimental designs to better understand the causal pathways between motivation, self-esteem, and vitality.

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