



The impact of music on athletes' motivation

Bachelor Thesis for Obtaining the Degree

Bachelor of Science in

International Management

Submitted to Marion Garaus

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Vienna, 14th June 2023

Affidavit

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Abstract

The link between physical exercise and desirable ergogenic and psychological outcomes on one hand, and listening to music while exercising on the other is well explored in the extant literature on music and exercise. It seems clear that listening to music while exercising has many benefits through multiple different mechanisms, with music tempo, familiarity and preference emerging as significant variables influencing exercise outcomes. One such mechanism influenced seems to be motivation for physical exercise, as a construct describing a person's drive to perform exercise. Therefore, the aim of this thesis was examining music tempo, familiarity and preference as predictors of motivation for physical exercise in a regression model, utilizing a survey research design. The results presented fail to determine either tempo, familiarity or preference as statistically significant predictors of motivation for physical exercise, but nevertheless present a valuable addition to the body of work on the association between music and motivation for physical exercise, providing important context and direction for future research on the same topic.

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INTRODUCTION

The influence of music on athletic performance has garnered significant research interest due to the encouraging effects music has on exercise endurance and ergogenic assistance (Nixon et al., 2022). Additionally, the use of music in athletic activities has been linked to enhanced performance, which indirectly suggests increased motivation among individuals (Karageorghis and Priest, 2012). Conversely, listening to music while engaging in sports or exercise activities can lead to experiencing positive emotions. Laukka & Quick (2013) report that using music in athletics leads to positive outcomes, including better performance and easier training. Moreover, Nixon et al. (2022) found that incorporating music during exercise increased motivation, leading to improved athletic performance. Concurrently, empirical studies on the impact of preferred versus less desired music in athletics indicate that music fosters positive psychological responses, which manifest as heightened motivation and subsequently, increased training intensity (Karageorghis et al., 2009). Specifically, the use of music in sports enhances an individual's mental and physical agility during exercise.

However, findings in this research area do not explicitly combine motor imagery, cognitive aspects, and motivational factors to provide a more comprehensive understanding of sports performance improvement (cf. Rhodes & May 2021). Moreover, the use of music allows an individual to exclude himself from all irrelevant information and devote himself exclusively to one goal while improving motor skills (Leon et al. 2014), which provides one explanation for the positive results of including music in sports.

Additionally, differentiating between short-term and long-term motivators, as well as exploring their interplay on an individual's self-perception and goal-setting in terms of performance, presents a new avenue for research involving both intrinsic and extrinsic motivation (Deci & Ryan, 2000). Hence, the underexplored area of music's impact on an athlete's motivation highlights the need for a model that focuses specifically on the individual and their personality type, taking into account the psychological traits of the person. The influence of music on athletic performance has gained significant research interest due to the positive effects music has on exercise endurance and ergogenic assistance (Nixon et al., 2022). Furthermore, the use of music in athletic activities has been associated with enhanced performance, indirectly suggesting increased motivation among individuals (Karageorghis & Priest, 2012).

Simultaneously, engaging in sports or exercise activities while listening to music can lead to experiencing positive emotions (Laukka & Quick, 2011).

Research has revealed that music, as an auditory stimulus, can have profound effects on an athlete's physiological and psychological states (Bishop et al., 2009; Edworthy & Waring, 2006). This interaction between music and an individual's mental and physical state may explain the increased motivation and performance observed in various athletic activities (Bishop et al., 2009). Syncing music with exercise or sports activities can boost motivation and performance. When someone's movements match a song's rhythm, it can promote a feeling of unity and fluidity, ultimately enhancing the workout experience (Karageorghis, 2017).

Music can be a powerful distraction from physical discomfort during exercise, raising an individual's pain threshold and tolerance. The effect is especially noticeable in low to moderate-intensity workouts, where people tend to focus more on music than fatigue (Hutchinson & Tenenbaum, 2007). As a result of that, athletes might push themselves harder and longer, indirectly boosting motivation and performance. Researchers have been investigating music's role in helping athletes achieve different flow states (De Manzano et al., 2010), which are marked by intense focus, heightened enjoyment, and optimal performance (Csikszentmihalyi, 1990).

While these studies offer different and valuable insights, a deeper understanding of music's impact on athletes' motivation and performance is needed. Factors like preferred music genre, tempo, and lyrics could play a crucial role (Jarraya et al., 2012). Additionally, music's motivational effects might vary based on sport type, competition level, and athletes' cultural backgrounds (Karageorghis & Priest, 2012). Given the growing reliance on music during training in challenging circumstances, like quarantine (Rajkumar, 2020), it's vital to better understand how music affects athletes' motivation and performance. This thesis aims to delve into the intricate relationship between music, motivation, and performance in athletic training, focusing on individual differences and personal preferences.

A more profound comprehension of how music interacts with an athlete's psychological traits could lead to targeted interventions for enhancing motivation and optimizing performance. As athletes increasingly use music to cope with stress and overcome training barriers, identifying the most effective strategies for incorporating music into their routines becomes essential.

Hence, the study aims to broaden the understanding of music as a motivational factor in athletes and highlight the positive impact on individual performance and motivation during training. Due to the quarantine situation, people worldwide engaged in sports activities, facing restrictions and increased solitude (Rajkumar, 2020). Consequently, many turned to using music during training. Music appears to be a key factor in enhancing an athlete's motivation without considering the individual's psychological traits. Specifically, the significance of music and its influence on athlete motivation during these challenging circumstances underscores the importance of this research topic (Terry et al., 2012).

Specifically, the current thesis examines the impact of incorporating music and its effects on athletes' motivation, as music may help athletes concentrate and disregard extraneous information. Furthermore, listening to music during training could potentially reinforce the motivation to attain goals and enhance motor skills (Karageorghis & Priest, 2012). Consequently, an individual might gain added endurance during exercise and improve their training performance.

Therefore, this thesis aims to address the following key research questions, building on existing literature and providing new insights through an empirical study:

1. To what extent does the music listened to by athletes influence motivation during training?
2. How do individual music preferences impact performance in sports?
3. In what ways does listening to music contribute to the improvement of athlete performance?

These questions aim to strike a balance between reviewing the current literature and identifying areas that warrant further investigation, while maintaining an open-ended approach.

1 LITERATURE REVIEW

This chapter provides an overview of the existing literature on motivation, focusing on its relevance to the relationship between music and athletic performance. The aim of this literature review is to lay a groundwork for understanding diverse theories and concepts related to motivation and their connection to music's influence on athletes. The focus on sports motivation, probing the part music plays in elevating athletes' drive and performance. Chapter examines multiple music aspects—tempo, personal taste, and customization—to provide an in-depth analysis of music's complex ties to athletic performance. With a deeper understanding of these factors, we're better equipped to harness music as a potent tool for boosting sports prowess.

1.1 A General Overview of Motivation

Motivation represents psychological element that impacts learning, performance, and overall well-being. Motivation in sports is vital for athletes as it affects their commitment to training, consistency with routines, and performance. Motivation comes in two main forms: intrinsic and extrinsic. Intrinsic motivation comes from individual's desire to partake in activities purely for the joy or satisfaction. Athletes fueled by intrinsic motivation usually possess a profound passion for their sport, drawing motivation from personal challenges and the sense of accomplishment they offer (Vallerand, 2007). Extrinsic motivation relies on external factors, including rewards, recognition, or social pressure. This motivation type appears in various ways – from pursuing financial gain and chasing accolades, to seeking the approval of others. While extrinsic motivation can be effective short-term, it might not offer sustained engagement and could undermine intrinsic motivation. Research indicates that an optimal balance of both intrinsic and extrinsic motivation is vital for athletes to maintain high performance levels and satisfaction in sports (Vallerand, 2007). Combining these motivational types ensures that athletes stay committed to their goals while enjoying the process of training and competition (Deci & Ryan, 2008).

Self-Determination Theory (SDT) asserts that individuals have three fundamental psychological needs underpinning motivation: autonomy, competence, and relatedness (Deci

& Ryan, 2000). Autonomy is the desire for self-determination and decision-making power; competence involves the need to feel capable and effective, and relatedness pertains to the sense of connection and belonging with others (Deci & Ryan, 2000). In sports, satisfying these basic psychological needs can foster intrinsic motivation and boost overall well-being (Deci & Ryan, 2008). Coaches and trainers are essential in creating an environment that nurtures these needs, positively impacting athletes' motivation and performance (Mageau & Vallerand, 2003).

Karageorghis & Priest (2012) said that motivation is a multifaceted element that significantly shapes athletes' engagement, performance, and satisfaction in sports. Balancing intrinsic and extrinsic motivation, guided by Self-Determination Theory principles, can lead to the best outcomes for athlete growth and success. Building on the understanding of motivation, it is important to explore the role of music in enhancing athletes' motivation. Music has been widely recognized as a powerful tool in influencing emotions, mood, and behavior (Karageorghis & Priest, 2012). In sports and exercise, music acts as a motivational aid, helping athletes concentrate, control arousal levels, and boost overall performance (Terry et al., 2012). Studies on music's effects on athletes' motivation mainly focus on synchronous and asynchronous music. Synchronous music has a tempo that matches athletes' movement patterns, while asynchronous music doesn't have a specific tempo-match and is generally used as background accompaniment (Karageorghis & Priest, 2012). Both music types positively impact motivation and performance in various sports settings (Terry et al., 2012). The music's characteristics, such as tempo, rhythm, melody, and lyrics, can interact with personal preferences and cultural background, resulting in highly individualized responses (Karageorghis & Priest, 2012).

Considering music's influence on sports motivation, practical applications for athletes, coaches, and trainers are crucial. Personalized music selection, tailored to an athlete's preferences and sport requirements, can maximize music's motivational benefits during training and competition (Karageorghis, 2017). For example, fast-tempo tracks might work better for high-intensity activities, while slower-tempo music suits low-intensity activities or recovery periods (Karageorghis & Priest, 2012). Incorporating music into pre-competition routines can help manage anxiety and enhance focus (Bishop, Karageorghis, & Kinrade, 2009). Coaches and trainers should encourage athletes to experiment with various music types and create playlists designed to evoke desired emotional and motivational responses during different training and competition stages (Karageorghis, 2017). It's essential to acknowledge that music's impact on motivation may vary among individuals. Factors like personal preferences, cultural

background, and sport nature should be considered when selecting and implementing music-based interventions (Karageorghis & Priest, 2012). In this context, open communication between athletes, coaches, and trainers is vital to ensure effective music selections that support athletes' needs and goals (Karageorghis, 2017).

It is important to note that the overuse of music or reliance on music as the sole motivational strategy may lead to habituation and diminished motivational effects (Karageorghis & Priest, 2012). Therefore, incorporating music as part of a comprehensive motivational strategy, including other interventions such as goal-setting, imagery, and self-talk, can provide a more balanced approach to enhancing motivation and performance (Weinberg & Gould, 2014). The impact of music on athletes' motivation offers promising avenues for practical applications in sports settings. By considering individual differences, cultural factors, and sport-specific requirements, personalized music interventions can be developed to optimize motivation, performance, and overall well-being. Combining music with other motivational strategies will create a well-rounded approach to supporting athletes in their pursuit of excellence.

1.1.1 Theories of Motivation

There are several different models that attempt to explain human behavior, attitudes, and the reasons why people do the things they do. As a result of the fact that the concepts of motivation and satisfaction are highly psychological in origin, highly subjective, and in no way objective, there is a close relationship between many of these and the field of psychology (Shafritz et al., 2005). The first investigation into people's mentalities was carried out in the latter half of the nineteenth century - exactly in 1888 - to be more specific. In the early 1900s, in reaction to Taylorism, a management philosophy that placed a great deal of emphasis on results, the first theories of employee satisfaction began to emerge. These theories were based on the idea that a happy workforce leads to a productive workplace. At the beginning of the 1920s, empirical research was carried out at the Hawthorne factory. This research served as the foundation for the start of a systematic analysis of the attitudes held by the workers there. It was discovered that social relationships and the dynamics of groups had a significant influence on performance. Later on, over the course of time, researchers who study organizational behavior shaped the concept of job satisfaction, which they naturally concentrated on. The results of this applied

research on boredom, fatigue, and job satisfaction help to explain, in part, why job satisfaction has become a measure of organizational happiness (Wright, 2006).

The decade that encompassed the 1950s was fruitful in terms of the development of ideas associated with various forms of motivation. Three theories are going to have more of their foundations laid out for them because of how applicable they still are in today's world and how widely accepted they are. Even though the veracity of these theories has been called into question in the modern era, they laid the groundwork for the development of more contemporary theories, and the terminology associated with these theories is still used in contemporary practice (Robbins and Judge, 2017). There are many different theories, some of which include: Maslow's Hierarchy of Needs, Herzberg's Two Factor Theory, and McGregor's Theory X and Y.

It is essential to keep in mind that Maslow was the first person to acknowledge the complex nature of the human being. The human being is regarded as a complicated entity and as an entity that is required to make decisions over the course of their lifetime in accordance with the various theories that are going to be discussed in the following paragraphs. A great number of unconscious factors, such as instincts and motives, as well as conscious factors, such as goals and desires, all play a part in determining the outcomes of these decisions (Hatch, 2006). When you have an understanding of where the study of motivation and satisfaction first began, it is much simpler to comprehend more contemporary theories. This is because of the reason stated above, which makes these theories a good basis for observing the motivational behavior of man.

1.1.1.1 Maslow's Hierarchy of Needs

Abraham Maslow was an American psychologist who developed a model of human motivation based on the concept that people are motivated to fulfill their most basic needs. Maslow's model is known as the hierarchy of needs. He proceeded to create a hierarchy of these needs by first classifying them into five distinct levels and then arriving at the conclusion that the needs located at the lower levels are more essential to one's day-to-day existence than the needs located at the higher levels. Lower-level needs are the basis upon which higher-level needs are constructed, and in order to satisfy higher-level needs, it is first necessary to satisfy lower-level needs. On the other hand, there are those who hold the opinion that a human being is capable

of temporarily forgetting a lower-level need in order to concentrate on the fulfillment of a higher-level need, provided that the individual is confident that he will be able to fulfill the lower-level need in the near future. beginning in the past. You want to finish your work even though you may be hungry because you want to feel that sense of accomplishment (level four), even though your need to eat (level one) is not currently being satisfied. You want to feel that sense of accomplishment because you want to feel that sense of accomplishment because you want to feel that sense of accomplishment. This is because the worker is aware that he will be able to eat as soon as he finishes his task, which is the reason why he is working so quickly (Maslow, 1998).

According to Maslow (1998), in order for a need to function as a motivator, it is necessary that the needs of those at lower levels of the hierarchy are first met. This is because the needs of those at higher levels of the hierarchy come after the needs of those at lower levels. In addition, once a request is satisfied, it is no longer effective as a driver of behavior because the request no longer exists. According to Maslow (1987), people are not always capable of recognizing the underlying motivation that drives their behavior. He seems to be of the opinion that this is the case. For instance, a human being might have the urge to eat, but the primary reason for him to do so might be to appease his anxiety about his own wellbeing rather than to satisfy his hunger. Numerous studies focusing on obesity provide evidence that lends credence to this hypothesis. The participants in these studies disclosed that they started engaging in compulsive eating after being bullied or harassed by other individuals.

For instance, physiological needs include things like hunger, thirst, sleep, warmth, and shelter, as well as sexual and other bodily needs, such as the need to urinate. Other bodily needs include the desire to urinate. Other physiological requirements, such as the urge to urinate, are also present (Maslow, 1987). According to Maslow's theory of the hierarchy of needs, the most fundamental and fundamental requirements that need to be met in order for a person to survive are the physiological needs of that person. According to Maslow's hierarchy of needs, the physiological needs, which are at the top of the first level of needs, are the most fundamental and important for a person's continued existence. They come before all other needs on this level. When an individual's fundamental physiological needs are not met, they are forced to direct their attention solely toward the achievement of that goal because they are unable to concentrate on their more complex wants in such a state. Once those needs have been met, individuals are able to move on to the next level of their needs, which may include needs related to their safety.

It is essential for businesses to acknowledge the significance of catering to the physiological requirements of their employees in order to cultivate a general sense of job satisfaction among workers and to make a positive contribution to their overall sense of well-being. This may include ensuring that working conditions are safe and conducive to a person's overall physical well-being, as well as providing adequate resources such as food, water, and rest breaks. Meeting the physiological needs of employees in a timely manner and in a manner that promotes employee satisfaction and well-being is one way in which organizations can contribute to the creation of a positive and stimulating work environment that promotes employee satisfaction and well-being. The majority of these needs are met by the employees themselves; however, providing rest breaks at work, health care providers, and lunch coupons, as some examples, can make the workplace a more pleasant place for employees to be in can make the workplace for employees. There are times when workers are overly enthusiastic about their work, and it may be necessary to tell them to take a break because otherwise they would not finish the task. If you do not tell them to take a break, the task may not get finished (Maslow, 1987).

According to Maslow's hierarchy of needs, in order for an individual to feel a sense of security, it is necessary for that individual to have his needs in the area of security satisfied. These prerequisites consist of ensuring one's own safety in addition to maintaining one's financial stability, one's physical health and well-being, and the protection of one's environment. The level of needs known as safety needs is the second level of needs in Maslow's hierarchy of needs. This level of needs is considered to be important to an individual's overall sense of well-being and security because it fulfills the need for a sense of protection. People who do not have these needs met are more likely to feel anxious and insecure, and they also may be unable to focus on the needs that are more important to them. After one's fundamental requirements have been met, he or she may progress to the next level of needs, which may include the requirements for love and a sense of belonging. The environment must meet certain security requirements, which include being completely free of any potential dangers and being in a secure location. This category can also include a person's current state of physical and mental health, in addition to their overall sense of well-being. Permanent employment and satisfactory working conditions are the primary realities of the environment in which the organization operates (Maslow, 1987).

According to Maslow's hierarchy of needs, an individual's social needs make up the third level of requirements that need to be satisfied before an individual can experience a sense of belonging and connection with other people. These requirements must be met before an individual can have meaningful interactions with other people. Companionship, attachment, and a feeling of belonging in one's community are some examples of these prerequisites. Certain individuals refer to these requirements as their "affiliation needs" (Buchanan & Huczynski, 2017). Maslow's hierarchy of needs places social needs at the third level, emphasizing their importance for an individual's overall well-being and sense of connection with others. When these needs go unmet, people may feel disconnected and isolated, making it harder for them to focus on more immediate needs. Once physiological, safety, and social needs are satisfied, individuals can move on to higher levels, such as esteem needs.

For businesses, it's crucial to recognize the importance of addressing their employees' social needs to enhance job satisfaction and contribute to overall workforce well-being. This can be achieved by creating opportunities for social interaction and connection among coworkers and fostering a sense of community and belonging within the organization. Additionally, providing chances for social engagement and connection with customers can further satisfy employees' social needs. Meeting the social needs of employees and providing a prompt response to those needs is one way for businesses to contribute to the development of a positive and supportive work environment that is conducive to the promotion of employee satisfaction and well-being.

According to Maslow's hierarchy of needs, the fourth level of needs is comprised of esteem needs, and these are the needs that an individual is required to fulfill in order to experience feelings of self-respect and self-worth. Examples of these demands include reaching one's goals, receiving praise from others, and earning the respect of those individuals. The need for respect can generally be broken down into two categories: the respect that we have for ourselves, as well as the respect that others have for us. A person's self-esteem can be understood to be the sum total of their thoughts and feelings regarding themselves. The level of respect that an individual garners from other people can be evaluated using a number of different metrics, such as recognition, status, achievements, attention, acceptance, prestige, independence, and respect. Praise and constructive criticism are two ways that employers can help their staff members feel more valued in their jobs. If our needs for belonging and respect are not satisfied, we will feel inferior and helpless; on the other hand, if these needs are satisfied, we will feel confident and secure (Buchanan & Huczynski, 2017).

In Maslow's hierarchy of needs, self-actualization is the highest level of need, and it refers to an individual's desire to improve himself to the greatest extent possible. Self-actualization is the highest level of needs in Maslow's hierarchy of needs, and reaching this level is generally considered to be the pinnacle of personal growth and development. According to Maslow's hierarchy of needs, self-actualization is at the top of the pyramid as the highest level of needs. A person is able to feel a sense of fulfillment and has found the meaning of his life when he is able to realize his full potential and accomplish all that he is capable of accomplishing. According to Maslow's theory, self-actualization is a lofty goal that, in order to be accomplished, a person must first have all of their other needs, which are located lower on the hierarchy, satisfied (Maslow, 1987).

The pursuit of one's own self-actualization satisfies the need for self-fulfillment, contributes to the meaningfulness of human existence, and is essential to the performance of work in an organizational setting. This encompasses a wide range of things, including but not limited to accomplishments, the growth of skills and competencies, and creative endeavors. Employees have a greater chance of experiencing a sense of fulfillment when they are able to express themselves at work and when they are able to successfully manage the responsibilities that are placed on their shoulders. In Maslow's (1987) hierarchy of needs theory, reaching the level of self-actualization is regarded as the highest possible level of accomplishment. When we talk about "personal fulfillment," what we really mean is the aspiration to live up to one's full potential and develop into the most complete version of oneself that one is able to be (Buchanan & Huczynski, 2017).

Maslow's theory has been criticized for a number of reasons, the most prominent of which are the order in which the needs are presented as well as the insufficient amount of empirical testing. Maslow's theory has also been criticized for its ambiguity and inability to easily predict behavior, both of which are common criticisms leveled against it (Buchanan & Huczynski, 2017). Additionally, Maslow's (1987) hierarchy had a strongly progressive view; however, other theories and published literature argue that needs from different levels can actually coexist in a similar manner. Despite the fact that it was not developed with the organizational context in mind when it was first developed, the theory is nonetheless widely accepted and continues to have an effect on management practice. This is the case despite the fact that it was not designed when it was first developed. Around the world, it has had an effect on a variety of

aspects, such as pay structures, management styles, and job design (Buchanan & Huczynski, 2017).

Figure 1. Clayton Alderfer's ERG theory



Source: Shikalepo (2020).

Clayton Alderfer reorganized Maslow's hierarchy of needs, arguing that three primary classifications of needs were more realistic than the original five. Alderfer's reorganization resulted in the ERG theory, which stands for Existence, Relatedness, and Growth needs. Existence needs correspond to Maslow's physiological and safety needs, relatedness needs align with social and esteem needs, and growth needs encompass self-actualization. Unlike Maslow, Alderfer suggested that when efforts to satisfy higher needs are frustrated, people revert to lower categories. He believed that all three categories could be present simultaneously, and this could occur at any point in time. ERG theory is particularly well-suited for application in business and organizational settings (Buchanan & Huczynski, 2017). By addressing the existence, relatedness, and growth needs of employees, organizations can create a more motivating and supportive work environment.

1.1.1.2 Herzberg's Two-Factor Theory

Herzberg's Two-Factor Theory, or the Motivation-Hygiene Theory, is a well-known motivation theory introduced by psychologist Frederick Herzberg in 1959 (Herzberg et al., 1959). This theory suggests that motivation and hygiene factors cause job satisfaction and dissatisfaction. Intrinsic factors improve job satisfaction and employee motivation. Factors that motivate employees are achievement, recognition, responsibility, advancement, and work nature. Hygiene factors can lead to job dissatisfaction if ignored, and they include company policies, supervision, working conditions, interpersonal relationships, and salary (Herzberg et al., 1959). Addressing these factors alone doesn't necessarily increase motivation but prevents dissatisfaction.

In sports and athletic performance, the theory can be adapted to understand the various factors impacting an athlete's motivation and satisfaction. For example, intrinsic factors like personal achievement, skill development, and sport-specific technique mastery can be considered motivational factors contributing to an athlete's overall satisfaction and motivation (Cerasoli et al., 2014). Moreover, recognition from coaches, teammates, and spectators can further enhance athletes' motivation and drive to excel. In contrast, extrinsic factors like coaching styles, team dynamics, and training facilities can be viewed as hygiene factors in athletic performance. While these factors may not directly contribute to motivation, addressing them is crucial to prevent dissatisfaction and maintain an optimal performance environment (Deci et al., 1999). For instance, supportive and fair coaching helps athletes feel valued, while inadequate training facilities or poor team dynamics can hinder performance and satisfaction. Applying Herzberg's Two-Factor Theory to sports and athleticism provides valuable insights into factors contributing to athletes' motivation and satisfaction. By understanding intrinsic and extrinsic factors' importance, coaches, trainers, and sports organizations can develop strategies fostering an environment promoting optimal performance and athlete engagement.

1.1.1.3 Expectancy Theory

Vroom's cognitive model of expectations starts from the assumption of a voluntary, conscious choice of behavioral alternatives, whereby individuals are guided by certain expectations about

the results and effects of behavior, the probability that they will achieve goals, and preferences between them. This theory is aimed at finding answers to why an individual in a specific situation chooses some behavioral alternatives (e.g., greater commitment and better work) while rejecting others.

The three main components of Expectancy Theory are expectancy, instrumentality, and valence. Expectancy represents an individual's belief that their efforts will lead to the desired level of performance. Instrumentality refers to the perceived relationship between performance and the achievement of specific outcomes, like rewards or recognition. Valence, on the other hand, is the value an individual places on the outcomes tied to their performance. According to Vroom, motivation (M) can be calculated as the product of expectancy (E), instrumentality (I), and valence (V):

$$M = E \times I \times V$$

In sports and athletic performance, Expectancy Theory can shed light on how an athlete's motivation is affected by their beliefs and expectations about their abilities and the potential results of their hard work. For example, if an athlete thinks that putting in effort and dedication will improve their performance (high expectancy) and that better performance will bring rewards like praise from their coach or a scholarship (high instrumentality), they'll be more inclined to engage in rigorous training and practice.

However, the value an athlete places on the outcomes (valence) also plays a crucial role in determining their motivation levels. If an athlete sees the rewards associated with improved performance as highly desirable, they will be more driven to strive for those outcomes. Conversely, if the athlete perceives the outcomes as less valuable, their motivation to engage in the necessary behaviors may wane.

Vroom's theory of expectations shows all the ways in which coaches and sports organizations can encourage motivation in athletes. Theory has shown that setting clear expectations, providing constructive feedback, and aligning rewards can improve performance in athletes. When using expectancy theory, it is important to consider the difference between athletes, by using a personalized approach coaches can tailor feedback to the unique needs of each individual athlete. Expectancy theory serves as a useful guide to understanding the cognitive

processes that drive athlete motivation and decision-making in sport, with which sports professionals can enhance athlete motivation, resulting in improved performance and satisfaction. Understanding and applying the principles of expectancy theory allows sports professionals to design strategies that support athlete motivation, leading to better performance and personal growth. Key components include setting achievable but challenging goals, providing timely, meaningful feedback, and recognizing the unique values and expectations of each athlete (Lee, 2007).

1.1.1.4 Self-Determination Theory

Developed by Deci and Ryan in 1985, Self-Determination Theory (SDT) is a psychological framework examining human motivation's impact on well-being and performance. Deci and Ryan's (1985) theory posits that people inherently seek growth, development, and personal fulfillment. Self-Determination Theory recognizes three fundamental psychological needs: autonomy, competence, and relatedness, which contribute to intrinsic motivation when satisfied. Autonomy, the need to control one's actions and decisions, plays a key role in sports (Deci & Ryan, 2000). Athletes who view their training as self-directed are more intrinsically motivated, committed, and persistent (Gagné et al., 2003). Competence, or the need to feel effective in pursuits, increases motivation and engagement when athletes feel they possess necessary skills (Amorose & Anderson-Butcher, 2007; Deci & Ryan, 2000). Relatedness, the need to connect with others, is crucial as well; athletes with strong social support are more intrinsically motivated and enjoy their experiences (Deci & Ryan, 2000; Reinboth et al., 2004).

Extrinsic motivation, driven by external factors, can also shape behavior (Ryan & Deci, 2000). However, Self-Determination Theory posits that intrinsic motivation is more sustainable and beneficial for well-being and performance (Deci & Ryan, 2000). Self-Determination Theory is often applied to sports and athletic performance to understand motivation, engagement, and persistence in athletes (Hagger & Chatzisarantis, 2007). Research reveals coaching strategies promoting autonomy, competence, and relatedness can enhance intrinsic motivation, improving performance and well-being (Mageau & Vallerand, 2003). Athletes perceiving a supportive environment engage in self-regulated behavior, leading to effective goal-setting, increased effort, and enhanced performance (Deci & Ryan, 2000; Hagger et al., 2010).

Music's impact on athlete motivation can be examined through Self-Determination Theory. Music during training and competition can boost intrinsic motivation by strengthening autonomy, competence, and relatedness. Music choice reflects personal preferences and identity, reinforcing autonomy (Karageorghis & Priest, 2012). Additionally, music helps athletes focus on skills and promotes flow, fostering competence (Terry et al., 2012). Music also connects athletes to their culture, team, or shared experiences, enhancing relatedness (Bishop et al., 2007). Considering individual differences and athletes' social contexts is essential. A personalized approach accounting for athletes' preferences, needs, and goals can maximize music's motivational benefits (Karageorghis & Terry, 2011).

1.1.2 Factors Influencing Motivation

There are number of factors that can affect an individual's motivation in sports and exercise settings, and they can be categorized as individual, situational, and environmental. Recognizing these factors is key to creating effective strategies to boost athletes' motivation (Deci & Ryan, 2000). Individual factors encompass personality traits, self-efficacy, goal orientation, and past experiences (Roberts & Treasure, 2012). Athletes that have high self-efficacy set ambitious goals, persist despite challenges, and maintain motivation, we can say that goal orientation can also significantly impacts motivation, with athletes adopting mastery or performance orientations. Achievement goal theory give us the crucial framework for understanding goal orientations' role in shaping athletes' motivation and behavior (Nicholls, 1984), achievement goal theory suggests athletes can be classified into task or ego orientations (Dweck, 1986), that can greatly influence their approach to sports and experienced outcomes.

Task-oriented athletes prioritize personal improvement and skill development, because they view success as the result of effort and learning, leading to intrinsic motivation. Intrinsic motivation fosters positive outcomes like increased enjoyment, persistence, and resilience (Ryan & Deci, 2000). Task-oriented athletes are more likely to adopt adaptive learning strategies and maintain high motivation levels despite setbacks, and ego-oriented athletes focus on demonstrating superior ability compared to others. This orientation often leads to extrinsic motivation, driven by external rewards and recognition (Ryan & Deci, 2000). Ego-oriented athletes may experience negative outcomes, such as increased anxiety, decreased performance, and burnout. Coaches and sports psychologists should create an environment that encourages

task-oriented goals and intrinsic motivation by emphasizing effort, personal improvement, and skill development instead of just winning or comparing abilities (Ames, 1992). Encouraging a task-oriented climate helps athletes develop a healthier relationship with sports, maintain high motivation levels, and reach their full potential. Situational factors like feedback, coaching style, and social support also affect motivation (Deci & Ryan, 2000; Roberts & Treasure, 2012). Coaches who adopt an autonomy-supportive approach, providing choice, acknowledging feelings, and minimizing external pressure, are more likely to foster intrinsic motivation (Deci & Ryan, 2000). Feedback from coaches, teammates, and significant others can enhance or undermine motivation, depending on whether it is constructive, supportive, and effort-focused (Horn, 2008).

Environmental factors such as training facilities, competition level, and cultural context can also influence motivation (Roberts & Treasure, 2012). A well-designed training environment promoting competence, autonomy, and relatedness can enhance intrinsic motivation (Deci & Ryan, 2000). The competitive level may impact motivation, with high-stakes competitions potentially creating anxiety and pressure, leading to decreased motivation. Cultural factors, such as societal values and norms, can shape athletes' perceptions and motivation to engage in sports (Henriksen et al., 2010). Understanding factors that influence motivation in sports is crucial for designing effective interventions and strategies to enhance athletes' motivation. By considering individual, situational, and environmental factors, coaches, sports psychologists, and other stakeholders can tailor their approach to meet each athlete's unique needs and preferences, ultimately promoting optimal motivation and performance.

1.1.3 Motivation in Sports

Motivation plays in sports vital role because is used for determining an athlete's commitment, performance and overall enjoyment, to understand factors that contribute to motivation in athletes' coaches, trainers, and sports psychologists need to design tailored interventions and support systems. Intrinsic motivation, is often marked by engaging in an activity for inherent enjoyment and satisfaction, and represent significant driver in sport participation (Ryan & Deci, 2000). Athletes with intrinsic motivation often show higher persistence, resilience, and optimal

performance, and they are more likely to remain committed and experience psychological well-being. Intrinsic motivation stems from genuine passion and interest, pushing athletes to overcome challenges and immerse themselves in their sport. Intrinsically motivated athletes focus on learning, personal growth, and improvement, contributing to ongoing success and development (Vallerand, 2007).

Persistence, crucial for intrinsically motivated athletes, allows them to maintain focus and dedication despite setbacks. This determination is essential for long-term achievement in sports (Vallerand, 2007). Resilience, another key attribute, enables athletes to bounce back from failures or disappointments and adapt to challenging situations. By fostering intrinsic motivation, coaches and support staff can help athletes develop persistence and resilience, ultimately promoting long-lasting success and well-being in sports. A resilient mindset helps athletes maintain a positive outlook, learn from their experiences, and continue working towards their goals, despite any adversities they may encounter. Optimal performance is often associated with athletes who are intrinsically motivated, as they tend to be more engaged, focused, and driven in their sport. Their love for the activity and desire for self-improvement can lead to enhanced skills, better decision-making, and ultimately, superior performance (Vallerand, 2007). Enjoyment and psychological well-being are also positively correlated with intrinsic motivation in sports. Athletes who participate in their sport for the pure enjoyment and personal satisfaction it provides are more likely to experience happiness, reduced stress, and a greater sense of well-being (Vallerand, 2007).

Extrinsic motivation, on the other hand, stems from external factors such as rewards, recognition, or fear of punishment (Ryan & Deci, 2000). While extrinsic motivation can be a powerful driver for some athletes, it may lead to suboptimal performance, stress, and burnout if the primary focus is solely on the outcomes rather than the process of skill development and personal improvement. Extrinsic motivation, in contrast to intrinsic motivation, is influenced by external factors that drive athletes to engage in their sport. These factors can include tangible rewards (e.g., trophies, medals), social recognition, praise from coaches or peers, or the desire to avoid negative consequences such as punishment or criticism (Ryan & Deci, 2000). Extrinsic motivation can be powerful for some athletes, but it doesn't always yield the best results for every athlete. When athletes are driven mainly by external factors, their focus might shift to end goals like winning or achieving a specific rank. As a result, they might overlook the importance of learning, honing their skills, and personal growth. This focus on outcomes can

lead to constant pressure to excel, which can, in turn, ramp up stress and anxiety. Relying purely on extrinsic motivation might also undermine an athlete's autonomy, competence, and relatedness, as per Self-Determination Theory failing to meet these needs can lower intrinsic motivation and overall well-being (Deci & Ryan, 2000).

Furthermore, putting too much weight on extrinsic motivators can result in burnout. This is a state of physical and emotional exhaustion caused by chronic stress and intense demands in sports (Raedeke, 1997). Burnout can hurt an athlete's performance, enjoyment of the sport, and willingness to keep participating. That said, extrinsic motivation isn't always harmful. When paired with intrinsic motivation, extrinsic factors can actually support an athlete's engagement in their sport (Ryan & Deci, 2000). For instance, rewards or recognition can bolster an athlete's intrinsic motivation, fostering a sense of competence and achievement. Additionally, social factors also have a crucial role in shaping an athlete's motivation. Supportive and positive relationships with coaches, teammates, and family members can enhance motivation by fostering a sense of belonging and competence (Mageau & Vallerand, 2003). In contrast, overly critical or controlling environments may undermine athletes' motivation and negatively impact their performance. Social factors indeed have a significant influence on an athlete's motivation, as they can either enhance or undermine their engagement and commitment to their sport. Supportive and positive relationships with key individuals in an athlete's life, such as coaches, teammates, and family members, can contribute to a sense of belonging, competence, and autonomy, which are essential psychological needs based on Self-Determination Theory (Ryan & Deci, 2000). Coaches play a particularly important role in fostering athletes' motivation. A coaching style that emphasizes autonomy support, empathetic understanding, and positive feedback can promote intrinsic motivation and help athletes develop a growth mindset (Mageau & Vallerand, 2003). In turn, athletes are more likely to embrace challenges, persist through setbacks, and experience greater satisfaction and enjoyment in their sport (Mageau & Vallerand, 2003).

Teammates and peers also contribute to an athlete's motivation through the social environment they create. Positive and supportive team dynamics can foster a sense of belonging and camaraderie, enhancing athletes' motivation to perform well for the group (Carron & Brawley, 2000). Additionally, observing and learning from peers can provide opportunities for skill development and foster a sense of competence (Carron & Brawley, 2000). Family members, particularly parents, can significantly impact an athlete's motivation by providing emotional,

financial, and logistical support (Côté, 1999). Encouraging and supportive parental involvement can contribute to a positive sports experience and bolster athletes' motivation to engage in their sport. Social factors can be a double-edged sword for athletes' motivation, as they can create negative environments if not handled well, for example a coach who focuses on punishment, negative feedback, or extrinsic rewards, might weaken athletes' intrinsic motivation and hinder their growth (Amorose & Anderson-Butcher, 2007).

Furthermore, goal-setting represents crucial aspect of motivation in sports. It offers athletes a sense of purpose, direction, and focus (Locke & Latham, 2002). By setting specific, measurable, achievable, relevant, and time-bound (SMART goals) athletes can track their progress, maintain motivation, and ultimately, improve their performance. Motivation in sports is a complex concept influenced by intrinsic and extrinsic factors, social support, and goal-setting. To foster a positive motivational climate, it's vital to understand and address these aspects, helping athletes reach their full potential and find enjoyment and satisfaction in their chosen sport.

1.2 Motivation in the Context of Music and Athleticism

Ochiai et al. (2018, p. 106) described motivation as the "drive behind one's eagerness and willingness to do something without being forced to". A research study by Adcock et al. (2006), offered insights into the neurological aspects of motivation. In the study it was shown that participants were asked to press a button at three-second intervals. They were split into two groups: one received rewards for completing the task correctly, while the other did not, then Adcock et al. (2006) used a 3D topographic map to examine the stimulus-preceding negativity (SPN) brain waves during the activity. They found that the right side of the frontal region in the brains of the rewarded group was activated, but not in the unrewarded group. This activation represents the neurological process of motivation.

The study emphasizes the neurological foundations of motivation, particularly concerning extrinsic rewards. By showing the activation of specific brain areas in response to rewards, the research sheds light on the neural mechanisms that fuel motivational processes. Understanding these neurological processes can help to elucidate how music might interact with the brain's reward system, potentially enhancing motivation in athletes. Furthermore, this knowledge can contribute to the development of targeted interventions that effectively leverage the brain's

motivational mechanisms, allowing athletes to optimize their performance and engagement in their respective sports. Ochiai et al. (2018) use this previous study to contextualize the association between reward and motivation. However, there are limitations between this context and the connection made to the impact of music on the motivation of athletes. Templin and Vernacchia (1995) experimented with five university basketball players. They were each given a video containing recordings of successful performances of themselves. The videos have music in the background and the players were instructed to watch them throughout the basketball season. During interviews after the completion of the season, players said that they felt more motivated after watching clips with their music rather than that of the investigator (Templin and Vernacchia, 1995).

Ochiai et al. (2018) suggest the music rewards their good performance and therefore neurologically results in higher motivation for the athletes, as per the study of Knutson (Ochiai et al. 2018). However, as Ochiai et al. (2018) acknowledge, it is not possible to determine to what extent the music had an impact on the motivation of the athletes compared to the video images of their previous high performance. Additionally, many scientific measures were not followed in this investigation such as the use of control groups and measures of athletic performance. More research is required to link the reward and motivation pathway with music in the context of athletic performance (Ochiai et al. 2018).

Motivation plays a crucial role in determining an athlete's engagement and performance in their respective sports. While the neurological process of motivation has been studied, as demonstrated by Adcock et al. (2006), understanding how this process may be influenced by external factors, such as music, remains an area of interest for researchers. The study by Templin and Vernacchia (1995) provided preliminary evidence for the potential impact of music on athletes' motivation, as it indicated that watching video clips of successful performances accompanied by music could enhance motivation. Though limited by methodology, this study can't definitively prove a direct connection between music and increased motivation in athletes (Templin and Vernacchia, 1995).

Karageorghis, Terry, and Lane's (1999) more recent study delved into synchronous and asynchronous music's effects on endurance athletes' motivation. Results showed both music types positively impacted motivation and overall performance, synchronous music having a marginally higher influence. Eliakim et al. (2013) analyzed background music's effect on young

swimmers' 200-meter freestyle performance, discovering that warm-up music led to better performance and a notable decrease in race time. This supports music as a motivational tool for athletes.

However, motivation is complex and influenced by various factors, like personal preferences, cultural backgrounds, and sport-specific demands (Karageorghis & Priest, 2012). Stork, Kwan, Gibala, and Martin Ginis (2015) demonstrated that self-selected music was more effective for enhancing motivation and performance during high-intensity interval training than researcher-selected music. This highlights the need for personalized music interventions considering individual preferences to optimize motivation and performance. Bishop, Karageorghis, and Loizou (2007) investigated music, exercise intensity, and gender's interaction on motivational outcomes, suggesting that music's motivational benefits might vary based on gender and physical activity intensity. This underlines the intricate relationship between music and motivation in sports. While research increasingly supports music's motivational role in sports, further studies should explore the complex interplay among music, individual differences, and sport-specific factors. This deeper understanding will help researchers, coaches, and athletes create personalized interventions, harnessing music's power to boost motivation, performance, and well-being in sports.

Furthermore, intrinsic and extrinsic motivation play vital roles in an athlete's engagement, persistence, and performance in sports. Knowing their differences and interplay offers valuable insights into maintaining high motivation levels and achieving peak performance. Intrinsic motivation is the drive to engage in an activity for its inherent enjoyment, satisfaction, and pleasure from skill mastery or personal growth (Ryan & Deci, 2000). Athletes with intrinsic motivation participate in sports because they enjoy learning, developing, and tackling challenges. This motivation type is linked to positive outcomes like enhanced persistence, resilience, enjoyment, and psychological well-being (Vallerand, 2007).

Conversely, extrinsic motivation is driven by external factors like rewards, recognition, social approval, or fear of punishment (Ryan & Deci, 2000). Athletes primarily extrinsically motivated may focus on specific outcomes, like winning competitions or gaining social status. While extrinsic motivation can powerfully drive some athletes, it may also result in suboptimal performance, increased stress, and burnout if the focus is solely on external rewards (Pelletier et al., 2001). Both intrinsic and extrinsic motivation impact an athlete's engagement and

performance, but their balance varies among individuals and over time. Ideally, athletes should combine both motivation types, maintaining a strong internal drive for personal growth while benefiting from external rewards and recognition (Vallerand & Losier, 1999).

Coaches, teammates, and family members can foster a balanced motivational profile by creating an environment supporting athletes' autonomy, competence, and relatedness (Mageau & Vallerand, 2003). Encouraging personal growth, giving constructive feedback, and celebrating achievements can nurture both intrinsic and extrinsic motivation, leading to optimal performance and sports satisfaction.

Furthermore, goal-setting is vital for motivation in sports, helping athletes focus, persist, and enhance performance (Locke & Latham, 2002). Clear, challenging, and realistic goals greatly impact motivation by providing direction, structure, and purpose. Athletes can set two main goal types: outcome goals and process. Outcome goals focus on the end result, like winning a competition or achieving a ranking. These goals are externally oriented and may be influenced by factors beyond an athlete's control. While motivating, outcome goals can also cause stress and anxiety if an athlete becomes fixated on results (Burton & Naylor, 2002).

Process goals focus on specific actions and strategies needed to achieve the desired outcome (Weinberg & Gould, 2014). These controllable goals directly relate to performance, such as maintaining technique or following a training plan. Process goals align with intrinsic motivation, emphasizing personal improvement and skill mastery (Dweck, 1986). Research indicates that combining outcome and process goals benefits athletes' motivation and performance (Burton & Naylor, 2002). Focusing on process goals helps maintain intrinsic motivation through personal growth and skill development, while setting challenging outcome goals provides extrinsic motivation, creating urgency and inspiring success.

To maximize goal-setting's motivational benefits, athletes should be encouraged to set specific, measurable, achievable, relevant, and time-bound (SMART) goals (Doran, 1981). This approach ensures goals are clear, realistic, and adaptable, letting athletes monitor progress, adjust strategies, and maintain high motivation levels throughout their athletic journey.

1.3 Psychological and Physical Impacts of Music

The source of an athlete's motivation for music can be derived from two main impacts identified by Ballmann (2021). He notes that independent of exercise, music has been suggested to influence multiple psychological states (Ballman 2021). This coupled with evidence of a positive state of mind increasing the motivation of athletes suggests that music may indirectly have a positive psychological impact on an athlete's motivation. However, questions remain about whether music makes the task at hand seem easier, or simply makes the exertion feel more pleasurable. The concept of dissociation has been applied to athletes' perception of exercise while listening to music, and thus their motivation. Karageorghis (2008) concluded that while running on a treadmill at eighty-five percent of capacity, music will not alter the perception of the information sent to the brain by the muscles and vital organs. Despite this lack of causation, music does mold how the mind understands the symptoms of fatigue. These findings build on Ballmann's (2021) discussion to suggest that the positive psychological impact and, consequently, motivation derived from music during exercise can be attributed to a change in the interpretation of fatigue.

Ballmann (2021) continues to discuss the physical impact of music on athletes' motivation. One measure of the motivation of athletes is their physical performance which can be attained through calculations such as the power rate, rating of perceived exertion, and heart rate (Jarraya et al. 2012; Laukka 2013;). Athletes with greater rates of the three aforementioned factors are suggested to be more motivated in their practice. Jarraya et al. (2012) conducted research with twelve young male athletes, each of a similar age, height, and weight. They undertook the Windgate test twice, independently from one another, with a forty-eight-hour recovery period in between. Before both tests, they completed a ten-minute warm-up, once with music and once without. The researchers found that music did cause the power rate to be significantly higher with music, however, the heart rate, rating of perceived exertion, and fatigue index were unchanged by the presence of music. As these values can be seen as an indicator of an athlete's motivation this could suggest a partial physical impact of music on motivation.

In particular, the literature does not provide consistent findings on the physical impact of music on athlete motivation. Arazi et al. (2017) invited a group of male athletes of similar age, height, and weight to a study by Jarraia et al. (2012), to participate in the anaerobic strength test

(RAST). This test is similar to the Windgate test. Contrary to the observations of Arazi et al. (2017), Jarraia et al. (2012) found that fast music resulted in “significant changes” in the assessment of perceived efforts. These conflicting results suggest that more standardized research on athlete motivation factors is needed. The two mentioned studies cannot be fully compared due to differences in the tasks performed and the interval between the collection of results. Moreover, more research is needed on the impact of music on female athletes to have more reliable conclusions about how music intersects with the motivation of athletes.

Research on the psychological and physical impacts of music on athletes' motivation has expanded in recent years, yielding diverse and sometimes conflicting findings. In addition to the studies mentioned above, several other investigations have shed light on the complex relationship between music, motivation, and athletic performance.

A study conducted by Terry et al. (2012) analyzed the influence of motivational music on endurance performance and the psychological response to exercise. Music can boost endurance and foster positive emotions like motivation and reduced exertion, as discovered by research. Stork et al. (2019) found that motivational tunes during HIIT workouts resulted in increased power output and enjoyment.

On the other hand, some studies show mixed outcomes. Edworthy and Waring (2006) observed that while faster tempos led to higher work output and heart rates, they didn't significantly impact perceived exertion. This implies that music's influence on athletes' subjective perceptions might be limited. Various factors, like sport type and personal preferences, can also affect music's impact. Yamashita et al. (2006) found that swimmers who listened to their preferred music during warm-ups experienced increased motivation and better performance. This emphasizes the importance of considering individual preferences. In team sports, research offers insights into music's motivational aspects in group settings. Bishop et al. (2007) revealed that rugby players experienced enhanced arousal levels and improved strength training performance when listening to team-selected music. This suggests that music can foster cohesion and shared purpose among athletes.

Methodological variability in these studies may partially account for inconsistencies. Further research using standardized protocols is needed, especially involving female athletes, to gain a comprehensive understanding of music, motivation, and athletic performance across genders.

Emotional regulation plays a crucial role in athletic performance. Music is known for its potential to influence emotions and can facilitate emotional regulation during sports and exercise (Laukka & Quick, 2011). Music can evoke happiness, relaxation, and excitement, which can impact athletes' motivation, engagement, and performance (Juslin & Sloboda, 2010). For example, listening to uplifting music can increase self-confidence and foster readiness (Bishop et al., 2007). In team-based sports power of music goes beyond entertainment. It unites athletes, boosts morale, and fosters togetherness. Music can also assist players in recovering from setbacks, rebuilding self-esteem, and maintaining drive. By heightening good feelings and tempering bad ones, tunes pave the way for optimal mindsets, tight-knit teams, and unwavering resilience. This winning combo leads to enhanced performance on the field (Terry et al., 2012).

Moreover, music can also serve as a coping mechanism, helping athletes manage stress and anxiety associated with high-pressure situations and reduce the negative impact of these emotions on performance (Terry & Karageorghis, 2006). Research has shown that listening to calming music before a competition can decrease anxiety levels and improve concentration, resulting in better performance (Labrague et al., 2017). The use of music in the context of sports and exercise can help athletes regulate their emotions, enabling them to harness the power of positive emotions and effectively manage negative emotions, ultimately contributing to enhanced motivation and performance.

1.4 Music Tempo

Another possible factor in the varied results of studies into the impact of music on athletes' motivation could be the role of music speed in the research methodology. A limitation of the literature presented in this review is the description of music used in the authors' research. These descriptions are either non-existent or terms such as "fast" (Andrews et al. 2021). Tempos of 100 - 120 BPM have been shown to increase performance (Andrews et al. 2021) and, therefore, performance (Wijnalda 2005). However, more research on slow music is needed.

Ochiai et al. (2018) discuss the relationship between music tempo, speed, and athletes' notions of success. A competitive nature is inevitably common among athletes as outcomes are often narrowed to winning or losing. In most cases, these notions of success and winning are directly tied to speed. Music with a higher tempo can motivate to succeed as it reflects the associated

speed. Athletes have reported music with a high tempo as focusing their mind on speed so their body can do the same. This focus may result in higher motivation (Laukka & Quick 2013; Ochiai 2018).

The relationship between music tempo and athletic motivation is a complex and intriguing area of research. While it has been established that music with faster tempos (100 - 120 BPM) can enhance performance. The link between music tempo and athletes' competitive nature is vital. Laukka & Quick (2013) emphasized that fast music can help focus on speed, often linked to success in various sports. This mental focus can lead to enhanced physical performance and motivation. On the flip side, slow music offers unique benefits depending on the situation and personal preferences. For instance, it can aid athletes during recovery, encouraging relaxation and stress reduction (Leman et al., 2013). Furthermore, slower music could be useful during warm-up routines, allowing athletes to concentrate on technique and form before increasing the intensity of their workouts (Edworthy & Waring, 2006).

In addition to tempo, other music characteristics, such as rhythm, melody, and lyrics, may also play a role in influencing athletes' motivation. For instance, motivational lyrics that emphasize resilience, determination, and personal growth could inspire athletes to push through physical and mental barriers during training and competition (Karageorghis & Priest, 2012).

1.5 Preference and Choice of Music

Our internal evaluation of music is largely determined by our personal preference for certain artists, types, and genres of music. Linking back to Ochiai et al. (2018), motivation may derive from the desire for a reward. Therefore, one may expect that music that does not conform to an athlete's preferences or choices may provide less motivation as their brain does not perceive it as a reward.

Ballmann (2021) went further than other studies discussed in this literature review by researching the impact of both preferred and non-preferred music on the motivation of athletes. Resistance-trained males aged 18 - 24 were asked to participate in bench press trials after warming up with either preferred or not-preferred music. This study measured a physical indicator of performance, the rate of perceived exertion as well as asking participants to rate

their motivation on a linear scale from one to ten. This allows one to analyze the interaction between performance and motivation and to substantiate the claim of Jarraya et al. (2012), that high physical performance also indicates high levels of motivation.

However, the study showed a divergence between the physical indicator of performance, rate of perceived exertion, and the linear rating of the motivation of athletes. The rate of perceived exertion was not significantly higher when preferred music was played, however, the numeric rating of motivation did increase. These findings echo claims of other literature in this review, that the motivation increased by music does not increase the performance of athletes but changes the performance experienced (Ballmann, 2021). More research is needed on how music preference and tempo interact and which factor takes precedent in the motivation of athletes.

The preference and choice of music play a crucial role in the motivational impact of music on athletes, as individual differences in taste, familiarity, and cultural background can significantly influence the effectiveness of music in enhancing motivation, focus, and performance. Each athlete has unique preferences in music, which can be influenced by various factors, such as personal experiences, upbringing, and exposure to different genres (Rentfrow & Gosling, 2003). Recognizing individual differences in music preference is essential for designing personalized interventions that effectively use music to boost motivation and performance (Karageorghis et al., 2009). Athletes' unique music preferences can significantly impact their motivation and overall performance. Preferences in music are shaped by personal experiences, upbringing, and exposure to various genres, emphasizing the significance of individual differences in determining how music impacts an athlete's motivation (Rentfrow & Gosling, 2003). To develop effective music-based interventions, it's crucial to consider personal preferences and the factors that influence music choices. This approach allows practitioners to customize music selections, evoking positive emotions, increasing focus, and boosting motivation and performance (Karageorghis et al., 2009).

Taking individual music preferences into account enables coaches, trainers, and sports psychologists to offer tailored support for stress management, self-confidence, and a positive mindset. Integrating preferred music in training and competition routines creates an immersive, motivational experience that aids in achieving goals and reaching peak performance. Custom playlists, crafted to match an athlete's tastes, maximize music's motivational power. Particular genres, tempos, or lyrics can strike a chord with athletes, generating an engaging and motivating

environment. Personalized playlists in sports contexts serve as potent motivators, helping athletes tap into music's unique emotional and psychological advantages (Karageorghis et al., 2006). This method guarantees that music selections align with the athlete's preferences, raising the chances of eliciting positive emotions, sharpening focus, and fostering optimal performance (Bishop et al., 2007). Crafting personalized playlists involves including specific genres, tempos, or lyrics that resonate with the athlete, allowing for a deeper connection with the music and a more immersive, motivational experience. By carefully choosing music that reflects an athlete's personal tastes, coaches and sports psychologists can better employ music to influence mood, self-confidence, and motivation, ultimately leading to superior performance outcomes (Karageorghis & Terry, 2011).

Recognizing the role of music preference and choice in athletic motivation is essential for devising effective strategies that leverage music's power to optimize performance. By considering individual differences, cultural influences, and personalization of playlists, researchers and practitioners can better support athletes in leveraging music as a motivational tool in their pursuit of excellence.

2 METHODOLOGY

2.1 Study design

The research design involves a data collection procedure and selected methods to be used in the collection and later in the analysis to answer the questions of key research questions (Creswell 2009). The study is based on a quantitative survey to collect primary data based on a convenience sample of 95 respondents. In this way, data could be quantified, compared, and analyzed using methods of description, analysis, and synthesis. Quantitative research in this paper was conducted using the closed-ended online questionnaire survey technique employing existing scales using Google Forms. The decision to survey the form of closed questions should be conducted online (Intrac 2017). The period of empirical research began in April and ended in mid-May.

Before starting to fill in the questionnaire accessed through the Google platform, the respondents were presented with a brief description of the topic of the empirical research, informing individuals that the survey is anonymous and that the data are used in writing this paper exclusively for educational purposes. The only condition for completing the survey in this research was that the respondents were of legal age and engaged in sports. The survey consisted of three parts, namely, the first part was based on asking questions with measuring motivation for physical exercise through a symmetric Likert scale of 1-7 (1 – I disagree completely; 7 – I agree completely). The second part of the survey started with a question about listening to music during the respondents' last exercise session, and if they answered "Yes", continued to questions about the type of music it was, then about the tempo of the music (was it, on average, faster or slower), familiarity with the music (were they familiar with the music they listened to, and was it a part of their customized playlist) and a final question about music preference (did they like the music); all of these questions again used a Likert-type scale of 1-7 (1 – I disagree completely; 7 – I agree completely).

2.2 Measures

To determine the respondents' motivation for physical exercise, 10 questions from The Sport Motivation Scale (Pelletier, Fortier, Vallerand, Tuson & Briere, 1995) were adapted to refer to

physical exercise and used in the final survey. A reliability analysis showed that the items used had a Cronbach alpha value of $\alpha = 0,76$. The motivation score used as the criterion value was calculated as a sum of all scores for each participant. Next, to examine the type of music respondents were listening to during their last exercise session, 4 questions were replicated and another 5 adapted from the Rentfrow & Gosling four-type model (2003; as cited in Laukka & Quick, 2013, Hallett & Lamont, 2016) to arrive at a total of 9 questions, with the items having an $\alpha = 0,49$. Finally, 2 questions about the music tempo, 2 questions about music familiarity and 1 question about music preference were adapted from the work of Karageorghis et al. (2006) and Laukka & Quick (2013). Items about tempo had an $\alpha = 0,51$, and items about familiarity had an $\alpha = 0,51$. The tempo score was calculated as a sum of the scores for fast tempo music and the recoded scores for slow tempo music, which was then averaged for each respondent. Similarly, the familiarity score was calculated as a sum of responses to the two questions about familiarity, which was then also averaged for each respondent. The preference of music was examined using one question, and the raw score was used in the final analysis.

The obtained data are firstly presented descriptively, in tables and graphs, to show the overall trends in this respondent sample. Then, assumptions for inferential statistic methods are checked and described, and a regression analysis was conducted and subsequently reported in this paper.

2.3 Analysis and Results

Based on the obtained results shown in tables and graphs, with the use of regression analysis as a technique for determining the predictive power of the variables of music tempo, music familiarity and music preference for the criterion variable of motivation for physical exercise it cannot be said that music tempo, preference or familiarity significantly predict motivation for physical exercise, as the variables were measured in this thesis, on this specific sample.

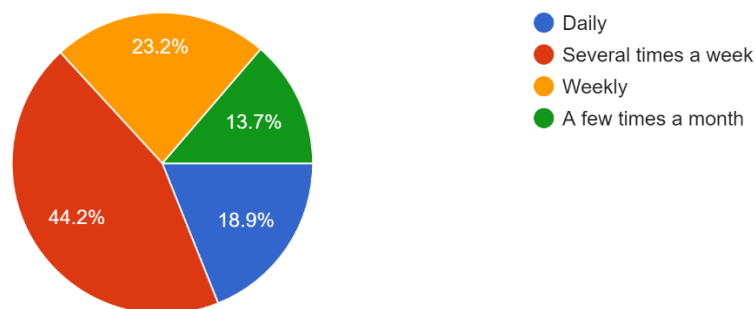
3 RESULTS

To illustrate the overall trend in the collected data on the tempo, familiarity and preference of music and the motivation for exercise, the results will be descriptively shown. The sample of respondents in this study consisted of 37 males and 58 females, totaling 95 respondents. Their average age was $M=27,83$, with the average experience in exercise expressed in years of $M=10,78$. Most of the respondents, 42 of them, engage in some form of physical exercise several times a week. A more detailed look into the descriptive characteristics of the respondent sample is provided in Table 1 and Figure 2.

Table 1. *Descriptive data (number, arithmetic mean, standard deviation and range) for age and exercise experience*

	N	M	SD	Range
Age	95	27,83	10,68	13-61
Exercise experience	82	10,78	9,46	0,16-45

Figure 2. *Frequency of engaging in physical exercise*



The survey also examined how many respondents listened to music during their last exercise session. 79 respondents answered positively and completed the survey questionnaire, firstly describing the type of music they listened to during their last exercise session, which is presented in Table 2; the remaining 16 respondents were excluded from further participation in the survey research.

Table 2. *Descriptive data (number, arithmetic mean, standard deviation and range) for the type of music respondents listened to during their last exercise session*

Music type	N	M	SD	Range
Reflective and complex	79	4,09	1,65	1-7
Intense and rebellious	79	4,68	1,63	1-7
Energetic and rhythmic	79	6,04	1,31	1-7
Pleasant and joyful	79	4,86	1,74	1-7
Aggressive and abrasive	79	5,10	1,71	1-7
Sad and depressive	79	3,24	2,02	1-7
Calm and soothing	79	1,81	1,50	1-7
Tranquil and sentimental	79	2,67	1,80	1-7

N – number, M – arithmetic mean, SD – standard deviation

Looking at the presented data, it is possible to glean that the respondents in this survey have varied music preferences, but on average chose more energetic and emotionally positive music and less calm and emotionally negative music, with the most popular choice being energetic and rhythmic music, and the least popular being sad and depressive music.

Then, in order to examine the variables of tempo, familiarity and preference as predictors of motivation for physical exercise, hierarchical regression analysis will be used. Before the actual implementation, it is necessary to check if the assumptions are met: absence of extreme results, normality of observed data, normality of their residuals, absence of multicollinearity and heteroscedasticity.

Primarily, since regression analysis is sensitive to extreme values, all results that deviated more than two standard deviations from the mean of the distribution were winsorized to the next most pronounced score inside the 2 SD cut-off. This treatment was applied to five cases. The significance levels in all tests used were set at $p=0,05$. Descriptive data for the variables used in the hierarchical regression analysis are presented in Table 3.

Table 3. *Descriptive data for the continuous variables used in the study and the corresponding indices of normality distribution.*

	N	M	SD	Range	KS	SW	Skewness	Kurtosis
Age	79	27,09	10,31	13-61	0,31**	0,73**	1,63	1,73
Exercise experience	82	10,78	9,46	0,16-45	0,14**	0,88**	1,26	1,58
Motivation	79	49,65	8,27	29-70	0,08	0,99	-0,14	-0,04
Tempo	79	5,72	1,09	3-7	0,18**	0,89**	-0,65	-0,67
Familiarity	79	5,64	1,31	3-7	0,22**	0,86**	-0,70	-0,90
Preference	79	6,59	0,69	5-7	0,43**	0,61**	-1,44	0,66

N – number, M – arithmetic mean, SD – standard deviation, KS – Kolmogorov-Smirnov test, SW – Shapiro-Wilk test; ** $p < 0,01$

The normality of the observed data was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Both the K-S test and the S-W test showed significant results for all but the motivation variable. It is important to note that tests of normality are highly sensitive in large samples, and even small deviations from the normality assumption are declared significant. Therefore, following the recommendation given by Field (2013), skewness and kurtosis indices can be considered, which in this sample were within the values of -2 and 2 for all variables. Together with the sample size, under the central limit theorem, the normality assumption of the distribution of the displayed variables can be assumed. The normality of their residuals was also verified by inspecting Q-Q plots, while the homogeneity of variances was tested using the Breusch-Pagan and Koenker tests (also recommended in cases of large samples), which indicated that the variables used did not significantly deviate from the assumed homoscedasticity.

Regarding multicollinearity, by examining the Pearson correlation coefficients between the selected variables, as shown in Table 4, it is evident that the coefficient falls within acceptable limits (lower than ± 0.8). Therefore, the results indicate the absence of extreme correlations between the variables used. Examining the variance inflation factor and tolerance indices further confirms the absence of multicollinearity among all variables. Thus, the prerequisites for conducting the selected analyses are satisfied.

Table 4. *Pearson correlation coefficients between continuous variables used in the study*

	Motivation	Age	Exercise experience	Tempo	Familiarity	Preference
Motivation	1	-0,08	0,17	0,12	-0,02	0,05
Age		1	0,34**	-0,24*	-0,1	-0,20
Exercise experience			1	-0,15	-0,24*	-0,31*
Tempo				1	0,35**	0,33**
Familiarity					1	0,49**
Preference						1

* $p < 0,05$, ** $p < 0,01$

To examine the variables of tempo, familiarity, and preference as predictors of motivation for physical exercise, hierarchical regression analysis was used; the variables of age, exercise experience, music tempo, familiarity and preference were included as predictor variables, and the variable of the motivation score was used as the criterion. In the first step, the demographic variables of age and exercise experience were included in the analysis, and in the second, the other variables were included. The results are shown in Table 5.

Table 5. *Results of the hierarchical regression analysis*

Criterion		Motivation
		β
Step 1	Age	-0,04
	Exercise experience	0,23
	R^2	0,05
Step 2	Age	-0,02
	Exercise experience	0,25
	Tempo	0,16
	Familiarity	-0,11
	Preference	0,09
	R^2	0,08
	ΔR^2	0,03

β – standardized regression coefficient, R^2 – proportion of explained variance, ΔR^2 – change in proportion of explained variance

By examining the results, it becomes evident that neither the age variable ($\beta = -0,04, p = 0,73$) or the exercise experience variable ($\beta = 0,23, p = 0,08$) proved to be a significant predictor of the overall motivation score ($F = 1,60, p = 0,21$), as could also be predicted from the low and insignificant first-order correlation results. Thus, neither age nor exercise experience explain a significant percentage of the total criterion variance, only accounting for less than 5% ($R^2 = 0,05, p = 0,21$).

The second step of the hierarchical regression analysis also proved to not be statistically significant ($F = 1,03, p = 0,41$), again in line with the low first-order correlation results. The second step of hierarchical regression, which includes all the included criterion variables – music tempo ($\beta = 0,16, p = 0,23$), music familiarity ($\beta = -0,11, p = 0,48$) and music preference ($\beta = 0,09, p = 0,55$) – collectively explains a statistically insignificant, albeit larger percentage of the criterion variance ($R^2 = 0,08, p = 0,57$). This represents a relatively small change compared to the first step; therefore, the change is also not statistically significant ($\Delta R^2 = 0,22, p = 0,03$).

4 GENERAL DISCUSSION

Available research on this topic, much of which is previously discussed in this paper (eg. Ballman, 2021; Brooks & Brooks, 2010; Karageorghis & Priest, 2012; Laukka & Quick, 2013; Ochiai et al., 2018) consistently demonstrates that listening to music during exercise can lead to various positive outcomes, such as ergogenic benefits directly linked to better exercise performance (eg. improved endurance, power output and strength outcomes) and psychological benefits that are indirectly linked to desirable exercise outcomes. For example, music has been found to increase exercise enjoyment, reduce perceived exertion and fatigue, and to distract individuals from feelings of fatigue or discomfort, promoting a more positive mood and mindset while exercising. Also, it seems the rhythmic qualities of music can help individuals synchronize their movements, leading to improved coordination and efficiency during workouts, even though a similar benefit of rhythm is found irrespective of the synchronizing aspect.

The choice of music genre may also impact exercise motivation. Different types of music, such as fast-paced and upbeat tracks, are often preferred for high-intensity or vigorous exercise, and are shown to be linked to various desirable ergogenic and psychological exercise outcomes; in

the same vein, tempo has been shown to have a similarly positive effect, with higher tempo songs being correlated with preferable brain arousal and stimulation patterns again promoting more desirable exercise outcomes, often via motivation. Moreover, individual preferences play a crucial role in the effectiveness of music during exercise. People tend to feel more motivated when they can select music that aligns with their tastes and preferences, so a personal exercise playlist seems to be a factor in exercise motivation and performance, as opposed to not listening to music or listening to third-party music such as that played in a gym.

Overall, the existing research highlights the significant role that music can play in enhancing exercise motivation, enjoyment, and performance. As such, the results presented in this paper do not align with the majority of the presented research, given that the tempo, preference and familiarity did not turn out to be significant predictors of exercise motivation. Still, a non-significant result such as this has value and does not in any way jeopardize the extant body of literature concerning the topic of the link between music and exercise motivation. The main issue of this study seems to be that it's based on a set of self-reported values regarding the last session of exercise performed while listening to music, and as such does not seem to be the optimal paradigm to research this topic, with much of the literature utilizing an experimental design, various imaging techniques and third-party evaluation of relevant variables such as tempo, preference and familiarity.

4.1 Practical implications

Given the results described above and the findings differing from much of the existing literature on the topic, there are several practical applications to consider. Firstly, while previous research has clearly and consistently shown positive outcomes associated with music during exercise, especially via motivation, which is the most pertinent finding in the context of this study, the presented results suggest that age, exercise experience, music tempo, preference, and familiarity did not turn out significant predictors of exercise motivation *in this particular sample*. Therefore, it is important to acknowledge that the effectiveness of music in enhancing exercise motivation may depend on personal and a myriad of other factors, such as cognitive factors, personality traits, and the context of the exercise environment, which weren't tested for or controlled in this study, and which may have influenced the results presented here.

Furthermore, this study's reliance on self-reported values regarding a specific, last exercise session – performed while listening to music – necessarily limits the generalizability of the findings. In contrast, much of the existing literature employs experimental designs, neuroimaging techniques, and more objective evaluation of variables such as tempo, preference, and familiarity.

4.2 Theoretical contributions

Since the results on the predictive value of music tempo, preference and familiarity emerged as statistically non-significant, the theoretical contributions of this study are presently limited. While the specific results presented in this study do not align with the majority of the existing literature on music and exercise motivation, they still contribute valuable insights. The study highlights the need for further investigation utilizing diverse methodologies and taking potential differences regarding the enhancement of exercise motivation into account (e.g. cognitive factors, personality traits, and the context of the exercise environment). The overall body of research consistently supports the significant role of music in enhancing exercise motivation and given the limitations of this study specifically in regard to this field of research, the previously presented results do not have the necessary rigor to warrant any re-evaluation unless these findings are replicated in much stronger study designs.

However, they do at least stimulate the discussion about relevance of music in sports and exercise. Presently, the body of literature concerning the link between listening to music and exercise outcomes does not contain many non-significant results akin to those presented in this study, but Drylund & Wininger (2008) seem to indicate that, at least when examining the association between the rate of perceived exertion and music preference, music does not lower the rate of perceived exertion, as would be expected looking at other relevant findings. The authors posit that if music is cognitively appealing it will be processed primarily over the physical sensations of the exercise, which holds true for low to moderate levels of exertion during exercise, but in bouts of high intensity exercise, the physical discomfort may overpower the influence of music. A similar mechanism might explain the non-significant results regarding the predicting of exercise motivation based on music tempo, familiarity and preference; it may be that the respondents' last exercise session was, on average, of a high enough intensity that it lowered the potential effect of music. Also, the average exercise experience of the sample of

respondents analyzed in this study was very high, numbering over 10 years. It is plausible that the effect of music on motivation is more pronounced in less experienced trainees, who are more sensitive to training related stimuli. Conversely, it may be that elite, professional athletes are able to benefit more from listening to music than recreational or hobby trainees.

4.3 Future research directions

While the specific results presented in this study do not align with the majority of the existing literature on music and exercise motivation, they still contribute valuable insights. The study highlights the need for further investigation utilizing diverse methodologies and taking individual differences into account, focusing on a specific variable such as tempo in an experimental setting, or assessing a specific facet of motivation such as intrinsic or extrinsic motivation for exercise linked to listening to music while exercising. Also, the survey used in this study could be primed to produce more salient results if it's administered on select individuals directly after an exercise session where it is apparent, they listened to music, or utilizing a more longitudinal design encompassing more than one exercise session. Variables as volume, emotional valence and music genre also have the theoretical backing to warrant inclusion in a repeated study of this kind in the future. It would be interesting to control for exercise intensity, and for professional athletes versus hobby/recreational trainees.

5 CONCLUSION

In conclusion, this study found that music tempo, preference, and familiarity did not significantly predict exercise motivation in the examined sample of survey participants. It is important to note that these results deviate from the majority of existing literature on the link between music and exercise motivation, which consistently demonstrates positive outcomes, specifically regarding tempo, familiarity and preference. These results emphasize the importance of considering additional individual factors and the exercise context when examining the effectiveness of music in enhancing exercise motivation. Factors such as cognitive factors, personality traits, and the exercise environment may influence the impact of music on motivation, but they were not directly tested or controlled in this study. Despite the non-significant results presented in this study, the overall body of literature supports the significant role of music in enhancing exercise motivation, enjoyment, and ultimately, performance. Replicating these findings with more robust study designs will be necessary before reconsidering the established body of research that consistently supports the significant role of music in enhancing exercise motivation and enjoyment. Hence, tailoring music selection to individual preferences and listening to upbeat, faster tempo music remains a practical strategy for enhancing exercise motivation. While the specific results of this study differ from the existing literature, they serve as a starting point for stimulating discussions about the relevance of music in sports and exercise.

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Appendices

Appendix 1: Survey

The impact of music on athletes' motivation

Dear Sir or Madam,

This survey aims to research the association between music preference, tempo and familiarity and exercise motivation. We would like to ask you for your participation in this survey, for which we thank you in advance. Your task is to carefully read each question, and respond by choosing the desired option or filling in the answer where prompted. Your participation is completely voluntary and anonymous, and the results gathered will be processed exclusively on the group level, hence we ask you to answer truthfully and spontaneously. The time needed to complete the survey is approximately 5 minutes. We emphasize that you have the right to withdraw from participation at any moment.

If you have additional queries, please send them to the following e-mail address: 61904044@modul.ac.at

By pressing the "Next" button you are giving your informed consent for participation in this research study.

Once again, thank you for your time and participation!

Sex *

- Male
- Female

Age *

Your answer _____

How often do you engage in some form of physical exercise? *

- Daily
- Several times a week
- Weekly
- A few times a month
- Other: _____

What is your exercise experience (expressed in months/years, eg. 7 months, 3 years, 1 year and 6 months etc.)? *

Your answer _____

The following statements pertain to your motivation during your last exercise session. Please recall your last exercise session when answering, and indicate the extent you agree/disagree with each statement by choosing the appropriate value (1 – I disagree completely – 7 – I agree completely).

I exercised for the pleasure I feel in living exciting experiences. *

1 2 3 4 5 6 7

I disagree completely I agree completely

I exercised for the pleasure of discovering new training techniques. *

1 2 3 4 5 6 7

I disagree completely I agree completely

I exercised because it allows me to be well regarded by people that I know. *

1 2 3 4 5 6 7

I disagree completely I agree completely

I exercised for the excitement I feel when I am really involved in that activity. *

1 2 3 4 5 6 7

I disagree completely I agree completely

I exercised because I wanted to feel good about myself. *

1 2 3 4 5 6 7

I disagree completely

I agree completely

I exercised because I like the feeling of being totally immersed in that activity. *

1 2 3 4 5 6 7

I disagree completely

I agree completely

I exercised because people around me think it is important to be in shape. *

1 2 3 4 5 6 7

I disagree completely

I agree completely

I exercised because it is a good way to learn lots of things which could be useful to me in other areas of my life. *

1 2 3 4 5 6 7

I disagree completely

I agree completely

I exercised for the pleasure that I feel while executing certain difficult movements. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

I exercised because I would feel bad if I was not taking time to do it. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

Did you listen to music during your last exercise session? *

- Yes
- No

The following statements pertain to some characteristics of music you listened to during your last exercise session. When answering, please indicate the extent you agree/disagree with each statement by choosing the appropriate value (1 – I disagree completely – 7 – I agree completely)

The music I listened to was reflective and complex. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was intense and rebellious. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was energetic and rhythmic. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely



The music I listened to was upbeat and conventional.

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely



The music I listened to was pleasant and joyful.

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely



The music I listened to was aggressive and abrasive.

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was sad and depressive.

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was calm and soothing. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was tranquil and sentimental. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to had, on average, a fast tempo (speed/beats per minute). *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to had, on average, a slow tempo (speed/beats per minute)

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was familiar to me. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

The music I listened to was from a personalized playlist. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely

I liked the music I listened to. *

	1	2	3	4	5	6	7	
I disagree completely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I agree completely
