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# Requirements Specification

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# **1 Introduction**

## **1.1 Purpose of Document**

This document identifies technical requirements related to a music-centered endurance running application.

## **1.2 Intended Audience**

The program is designed to cater to a wide range of users, from complete beginners with no prior running experience to seasoned professional runners. RhythmRun aims to revolutionize the way people approach running by leveraging the power of music to enhance endurance, motivation, and performance. For beginners, the app provides a structured yet flexible experience by measuring heart rate and running pace in real-time, automatically adjusting the music tempo and intensity to match their optimal performance zone. This personalized approach helps users achieve their running goals more efficiently compared to traditional methods, making the process less intimidating, more enjoyable, and highly effective. For experienced runners, RhythmRun offers advanced features to fine-tune their training, optimize performance, and break through plateaus.

# **2 General Description**

## **2.1 Product Goal**

The goal of the RhythmRun application will be to integrate APIs like Spotify and Apple Music to provide a convenient way for the user to upload their desired playlist. Once uploaded, RhythmRun will analyze each song's beats per minute to align the frequency with the user's desired pace goal. Once the songs are organized into playlists tailored to different pace groups, users can choose the playlist that best matches their desired pacing goals for any cardio session. This allows them to enhance their aerobic fitness by synchronizing their pace with their favorite tunes. Thus, the RhythmRun application will need to process imported music playlists, analyze beat per minute (BPM), and generate multiple output playlists categorized by pace group intervals.

## **2.2 Product Profile**

RhythmRun is designed for mobile devices and will support both Apple and Android. It provides an interface for runners to create and customize music-based endurance workouts. Users can upload songs from local files or, if available, use APIs like Spotify or Apple Music to upload playlists. The app analyzes the BPM of each uploaded song and organizes them into a structured workout playlist. In the aspirant scope, users can reorder songs (within intensity categories) in the generated playlist to fine-tune their workouts. The app offers at least one type of structured workout. Advanced features

will include subtle tempo adjustments and song trimming, as well as performance-tracking features like heart rate, distance, and elevation measurements.

The following context diagram provides a general overview of the inputs of the RhythmRun application:

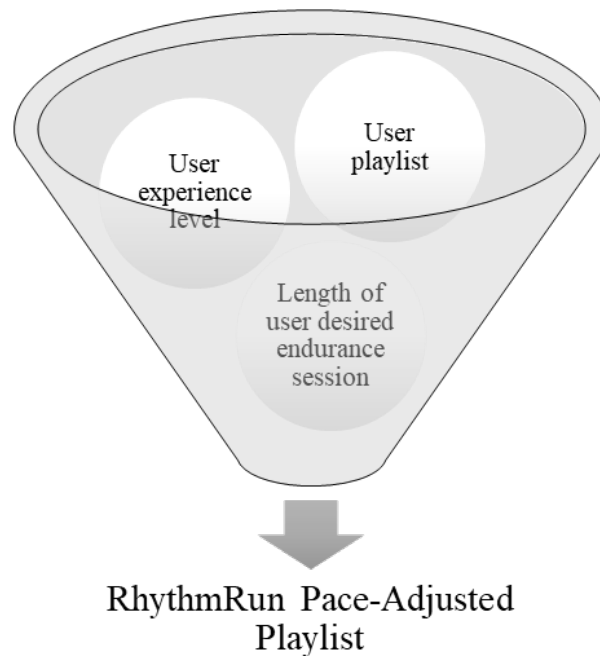


Figure 1: RhythmRun Context Diagram

## 2.3 Assumptions and Dependencies

It is assumed that RhythmRun will be downloaded onto a mobile device to use during a workout, and that the user has a basic familiarity with mobile apps. It is also assumed that the user has adequate storage space for the app's audio processing, playlist generating, and real-time (aspirant scope) tasks. It is assumed that the user will upload legally obtained music for use in playlist generation. The user should have a way to listen to music—whether it be through a speaker or wire-connected/Bluetooth headphones. For minimum scope, it is assumed that the user is uploading an adequate number of songs and that these songs fit the requirements of the workout template. However, a feature that recommends that the user add X number of songs to give RhythmRun an adequate amount of information to generate personalized playlists will be present. In other words, the less input songs, the less personalized the playlists will be for the user.

### 3 Functional Requirements

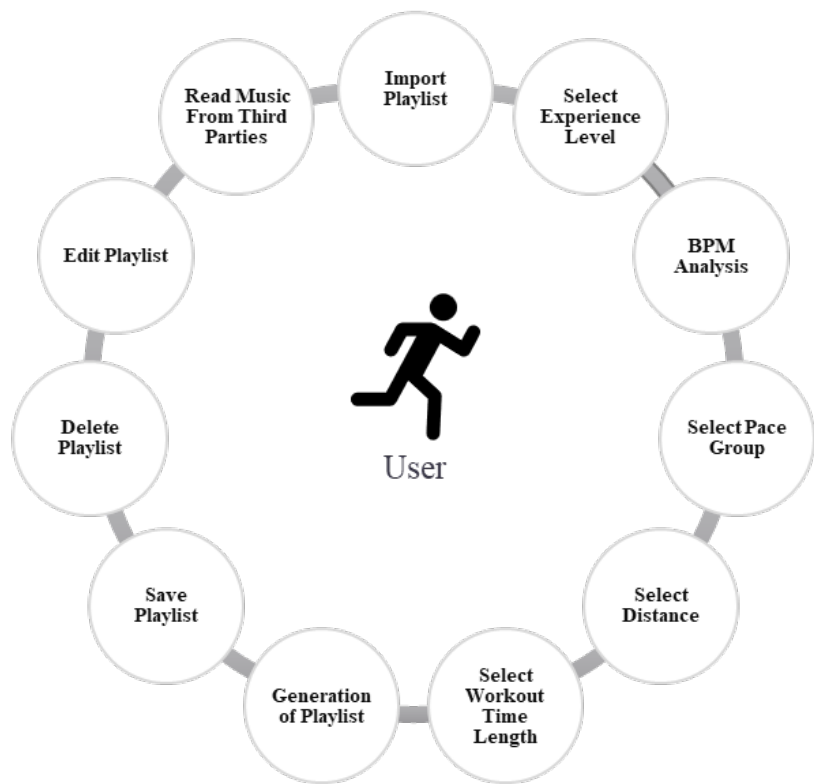


Figure 2: RhythmRun User Case Diagram

#### 3.1 Playlist Upload & Processing

##### 3.1.1 Import Playlists from Local Files (Minimum Scope)

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to support importing playlists from my local files so that I don't have to recreate them from scratch.
I want the RhythmRun application to include a dedicated way for importing playlists from my local files, making the process generally quick.
I want the music I am listening to match the mood of what I am doing because music is motivational to me. Ex; If my goal is to run at tempo pace, I want more up-beat songs!
Dependencies: None

### 3.1.2 Import Playlists from Streaming Services (Aspirant Scope)

#### As a Spotify/Apple Music user...

I want the RhythmRun application to support importing playlists from third-party streaming services (e.g., Spotify, Apple Music) so that I don't have to recreate them when switching apps.

I want the RhythmRun application to include a dedicated way for importing playlists from third-party streaming services.

Dependencies: None

## 3.2 BPM (Tempo) Analysis & Playlist Generation

### 3.2.1 BPM Analysis

#### As a runner...

I want to improve my ability to pace my runs because I want to build endurance.

I want to run to the beat of a song because I have trouble perceiving pace on my own.

I have trouble keeping engaged during runs because the sport can oftentimes become monotonous.

I want to pace my runs to the beat of a song because I may risk injury by taking my runs out too hard in the beginning.

Dependencies: 3.1.1 and 3.1.2

### 3.2.2 App Generation of Playlists

#### As both a music enthusiast, and someone who enjoys running...

I want the RhythmRun application to automatically generate playlists based on a target beats-per-minute (BPM) range so that I do not have to organize it myself.

I want to eliminate the task of manually searching for songs that I both enjoy, and have the right BPM for my fitness level.

Dependencies: 3.2.1

**3.2.3 Recommendation of Additional Songs (Aspirant Scope)**

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to suggest songs similar to the songs in my playlist so that my playlist is not repetitive, and I can discover new songs that also align with my pace.

Dependencies: 3.2.1

**3.3 Selectable Performance Levels****3.3.1 General Experience Levels**

**As a runner...**

I want the RhythmRun application to allow me to report my endurance experience level because I want my workouts to align with my personal fitness goals.

I want the RhythmRun application to allow me the option to select from multiple pace groups because my workout choice will vary.

Dependencies: 3.2.1

**3.3.2 Precise Experience Levels (Aspirant Scope)**

**As a new runner...**

I want the RhythmRun application to give me the option to select from preset pace groups because I am unsure of my current fitness capabilities.

I want the RhythmRun application to allow me to choose if I would prefer to start off my run slower, or faster than the overall average pace because I am still grasping the type of runner I am.

Dependencies: 3.2.1

### 3.4 Song Intervals and Transitions & Workout Customization

#### 3.4.1 Tempo and Length Adjustments

**As a runner...**

I want the RhythmRun application to allow both manual and automatic tempo and length adjustment because I may want to choose some songs, but not all.

Manual being I can choose the tempo and length adjustments on my favorite songs, and automatic being the application applies algorithms to adjust the tempo and the length for me.

Dependencies: 3.1, 3.2.1, 3.3

#### 3.4.2 Smooth Song Transition

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to make sure each song can transition smoothly because I don't want my listening experience to have sudden interruptions in it.

I want the RhythmRun application to have a feature to repeat songs or playlists because I may want to listen to it multiple times during a session.

I want to be able to pause, and or change my workout/current playlist if I mistakenly selected a pace interval that I thought I could keep up with.

Dependencies: 3.1, 3.2.1, 3.3

#### 3.4.3 Custom Workout Configuration

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to allow me to manipulate a playlist because I want to be able to change the order of the songs in the workout playlist.

Dependencies: 3.1, 3.2.1, 3.3



### 3.5 Saving Playlists

#### 3.5.1 Choice of Saving

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to save playlists that I have or it has created because I don't want to worry about a playlist I like being lost forever.

I want the RhythmRun application to allow me to choose whether to save a playlist because I want to be able to keep only the playlists I like and discard the rest.

I want the RhythmRun application to allow me to choose whether to save playlists into Spotify or Apple Music because I want to access them later through the respective apps.

Dependencies: 3.1, 3.2, 3.3

#### 3.5.2 Multiple Playlists Savable at Once

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to be able to save up to several playlists at the same time because I may be in the mood for different playlists at different times.

Dependencies: 3.1, 3.2.1, 3.3

#### 3.5.3 Choice to Delete Playlist

**As both a music enthusiast, and someone who enjoys running...**

I want the RhythmRun application to allow me to delete saved playlists because I only want to have and listen to playlists I truly enjoy.

Dependencies: 3.1, 3.2.1, 3.3

### 3.6 GPS Tracking, Performance Stats, and Real-Time Measurement

#### 3.6.1 GPS Path Tracking (Aspirant Scope)

**As an avid runner...**

I want the RhythmRun application to record running routes because I want to see my past running routes.

Dependencies: None

### 3.6.2 Smart Watch Integration (Aspirant Scope)

**As an avid runner...**

I want the RhythmRun application to gather statistics on a user's distance traveled and elevation changes because I want to track various performance metrics.
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Dependencies: 3.6.1
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### 3.6.3 Apple Watch Integration

**As an Apple/Smart Watch owner...**

I want the RhythmRun application to be compatible with my smart watch because I want my running data to sync with my iPhone through Apple Health
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Dependencies: None
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## 4 Non-functional Requirements

### 4.1 Requirements for the Environment

RhythmRun functionality requires the following of the user:

- a smartphone on iOS 15 or above, or Android 14 or above.
- a smartphone with a working speaker or access to wireless headphones that are paired with the device or wired headphones that are plugged directly into the device.
- an internet-connected device if accessing Spotify or Apple Music. (Aspirant Scope)
- requires X amount of storage with X amount of local storage for playlists.
- permissions to measure location data and walking data through the device's accelerometer, GPS module, and gyroscope that may be taken from either the primary device (i.e. iPhone or other smartphone) or the secondary device (i.e. Apple Watch or Samsung Galaxy Watch or another smartwatch). (Aspirant Scope)
- an A11 processor or newer for iOS devices.
- at least 3 GB of RAM or more.

## 4.2 Requirements Regarding Data

RhythmRun requires sensitive data information permissions and assumes the following:

- music is legally obtained from trusted sources such as Spotify or Apple Music.
- the application has been downloaded and installed from a trusted medium namely the Google Play Store for Android or the App Store for iOS.
- the application stores location data privately through encryption with location permissions given by the user.
- the application sends health data directly and privately to Apple Health through HealthKit integration.

## 4.3 Requirements Regarding Error Conditions

The RhythmRun application is not directly responsible for the following events:

- the user is injured or downed during the prescribed workout directed by the application.
- any operating system crashes that may occur during the usage of this application

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