John Guner

Professor Coleman

18 November 2022

Evaluation Plan

* Research Questions:
  + Will the lifter interpret the different pitches properly for the hand position?
  + Does the sonification of their body assist in performing movements?
  + Does the lifter have a better understanding of which portions of their body are being activated?
  + Is there a better way in which the sonification could be less complex and intuitive to understand?

Participants

I will need someone that has a strong understanding of their body’s components in the four compound lifts. This person will be able to accurately critique the sonification aspect of the project since they already have mastery on how their body moves in these exercises. A way to recruit someone for this task would be to approach someone who has excellent form in the gym and ask them if they would be interested in participating.

Measures

The measures will primarily focus on the lifter’s subjective thoughts on how the sonification of their body affects their lift and concentration on muscle activation. They would already have a strong depth of understanding their own body and the criticisms that they present would illuminate the project’s shortcomings. A post study survey of attitudes and optimality regarding their experience would be most likely to provide accurate feedback. A NASA TLX questionnaire alongside questioning and video evidence to record form would be sufficient to gauge the realistic productive use of the project and ease for beginner lifters.

Protocol

Once I have a participant willing and able to test the simulator, I will adapt a video of someone going through the various hand grips for a compound lift and simulate the differences in sound. The participant will then be asked if they comprehend the differences in sound and how they correlate to the hand positions. If they indicate yes, then we proceed, if they indicate no, then I will go ahead and explain how the tone is muffled based on how the hand position is shifted. Then the video will provide someone who is already in proper starting position in regards to the hand position it will then move on to back position, if the back is straight the higher tone will be clear, otherwise the tone will be muffled indicating an arched back. Then I will ask if they understand what the circumstances of this tone were and how it changes. If they answer correctly, I will continue with the process otherwise I will explain that it correlates with the back position. Now once the starting position has been solidified, I will proceed the video so that the compound lift starts. As the compound lift starts the sine waves indicating the primary Y coordinate of the bar start from a low frequency and then increase to a higher one as the rep progresses to the maximum extent, a guitar noise will indicate back position if the guitar noise is panning rapidly then the back must be fixed otherwise continue. Knees will be a metronome noise where if the knees are in good position a constant bpm will be present, if the bpm speeds up then the knees are over adjusting. I let the user experience this prior to giving knowledge to see if they can interpret it via experimentation to see if it is accessible to beginners. Proceeding in the exercise, if maximum extent is reached a TTS will play that states rep completed, if it is not achieved then the sine wave will still be present. Once the rep is completed the simulation ends and then enables its rest mode which is a timer countdown for one minute. The amalgamation of different elements might initially be confusing so I will ask if the participant was able to extrapolate any information from the simulation. Depending on what information was able to be identified properly with the body, I will then elaborate on what the other sounds indicated. Then the participant will have more time to experiment with the simulator and form the mind muscle connection with the sounds and visual stimulus. Once they feel as if they have a stronger understanding of the sonification I will instruct them to perform which ever compound lift they prefer with and without the sonification while recording their lifting technique. They will do 5 repetitions of light weight without sonification. Immediately after we will give them a NASA TLX survey on that task. After this is recorded the sonification set will start with 5 repetitions of light weight. on regards to the task with sonification Initially starting with the hand grip, as mentioned earlier it will follow the same sonification process with the tuning in and out based on adjustment. Then that tone will stop when properly adjusted, the back position will start adjusting if it needs it to be adjusted via the same method as the hand grip. I will then make the simulation start the exercise and have the participant perform the lift with light weight. I will simulate their experience with the necessary sounds and have them complete maximum extension. After that I will give them a NASA TLX survey and then discuss how they felt the sonification affected their performance and whether or not it made the mind muscle connection easier to focus on. In order to analyze the accessibility of understanding the simulation we will note the answers that the participant gave when initially showing the video, their thoughts after the set and record their reasoning for their scores given on the NASA TLX survey. Finally, the objective data that will be analyzed will be the video recordings which will take a look at form and see if there are any drastic changes in form. We will thank the participant, give a handshake and send them on their way.

Analysis

The analysis portion will provide insights into if the sonification of the body makes sense to someone who is experienced with the lifts so, if the experienced lifter does not understand the sonification it will be safe to say that a beginner would also not understand. This will be generalized from the showing of the simulation without proper context and then post-context. Furthermore, the NASA TLX survey can indicate if the task was simplified with the use of sonification or bombarded the user with more sensory information than was necessary. The recording can provide an objective based comparison of the differences before and after using the sonification program to identify if there have been any differences in form. The cohesive understanding of the sonification can indicate that the project was successful and has merit to be continued. The data will be used to analyze how the app can be improved, which areas are confusing, and how it affects performance and mindset to guide whether the app is successful.