CrossFit+HCI: Improving the Design of Remote Fitness Coaching Platforms

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CrossFit+HCI is a new project to study remote coaching for fitness athletes. Through a contextual-design study, crafting a design framework, and designing and implementing a new remote-coaching platform we will show how to: use design to strengthen the coach-athlete collaboration when remote coaching, properly program workouts so that they can be tracked and analyzed, design the platform so that it is usable for novice athletes, but powerful enough for elite athletes, and finally, design the platform for inclusivity so that it can be used by adaptive athletes.

1 INTRODUCTION

Remote coaching is a form of coaching that takes place over the internet where a person is paired with a remote coach that can help them improve in some area of their life. The area of focus is commonly health, fitness, wellness, sports, career, or life skills. The COVID-19 pandemic resulted in an explosion of remote coaching need due to the lockdown restrictions. Gyms, sports, and education all shifted online in the hopes to help their members continue their areas of interest. However, remote coaching platforms for many of these areas, especially for fitness and sports, do not exist which resulted in remote coaches using a hodgepodge of technologies to try to connect with their clients remotely.

Fitness and sports training requires a lot of infrastructure to conduct online in a way that is useful and enjoyable for both the coaches and the athletes. Training programs must be able to be created, shared, and completed in a way that can be tracked and analyzed. Coaches and athletes must be able to send and receive feedback on physical body movements either via streaming or video uploads. That feedback might need to be superimposed over the video or split videos need to be created. Thus, a remote coaching platform for fitness and sports is really just that, a platform, consisting of many different technologies that interconnect to form a useful and enjoyable environment for coaching.

We propose the CrossFit+HCI project, a new project to study how to design remote coaching platforms for fitness and sports coaching through studying remote and traditional coaching of CrossFit athletes from the novice level to the elite level. CrossFit is a unique area to study remote coaching, because CrossFit training consists of a wide range of fitness and sports movements, and thus, being applicable to a lot of areas, a large number of CrossFit athletes are

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remotely coached including novice and elite athletes, and CrossFit has adaptive divisions for athletes with disabilities making it a great area for studying accessibility in remote coaching platforms.

The driving research question of the project is what is the proper design of remote-coaching platforms for CrossFit? The answer to this question will lead to a design framework showing how to: use design to strengthen the coach-athlete collaboration when remote coaching, properly program workouts so that they can be tracked and analyzed, design the platform so that it is usable for novice athletes, but powerful enough for elite athletes, and finally, design the platform for inclusivity so that it can be used by adaptive athletes. To answer this research question we will be carrying out a contextual-design study observing remotely coached athletes, their coaches, and traditional coaches who use paper-based methods of tracking athlete performance. Then we will craft a design framework for remote coaching platforms, and design and implement a new remote-coaching platform called Your Training Journal (YTJ) that can be used to conduct usability studies for testing our design framework.

So how does this impact healthcare delivery? We believe that by studying remote coaching platforms for CrossFit that the design framework will transfer to remote platforms for healthcare, education, mentoring, and any other remote coaching area. They all have a non-empty intersection of needs like some form of tracking and analysis, task completion, feedback gathering, and collaboration. The design elements we discover will help our understanding of how to design each of these types of components for remote coaching. Furthermore, understanding how to better coach fitness and sports can lead to a healthier world, because it could lead to building platforms that are more enjoyable to use which could lead to more people taking part in remotely coached fitness.

2 STUDYING REMOTE COACHING PLATFORMS THROUGH CROSSFIT

CrossFit is a great fit for studying remote coaching of athletes of all skill and fitness levels. Over the course of the last three years remote coaching within CrossFit has exploded. From the elite coaching options like PRVN, the training and coaching company behind seven-times CrossFit Games champion Tia-Clair Toomey, and HWPO, six-times CrossFit Games champion Matt Fraser's coaching and training company, to nutrition and fitness coaching for the everyday person every major CrossFit coach now offers both in-person and remote coaching options. On the nutrition side, companies have begun offering remote coaching with coaches and professional athletes at an affordable price [1]. This implies that we will have a high number of potential remote coaches and remotely-coached athletes within the CrossFit area to recruit for studies on remote coaching platforms.

CrossFit employs a diverse set of training movements. Thus, by studying how to design remote coaching platforms of CrossFit athletes we are studying remote coaching platforms for a large number of subareas that can learn from our design framework. For example, a typical CrossFit training program would draw from areas like Olympic Weightlifting, Gymnastics, Running, Mobility (stretching, yoga, calisthenics), body building, and power lifting. Any remote coaching platform would have to be designed to track, analyze, and support coach/athlete collaboration for all these areas. These areas increase for elite athletes that train to be part of the sport of CrossFit.

Elite CrossFit athletes are professional sports athletes that train year round for the CrossFit Games[1]. These athletes and their coaches are experts in fitness training, because the CrossFit Games is a overall test of fitness, and thus are an excellent source of knowledge on fitness training for remote coaching platforms. They not only train in the same areas as the typical CrossFit athlete, but they train in a number of additional areas like swimming, agility, sprinting, endurance training, and cycling. While it is important to study the everyday person in the design of the type of platform

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[1]The championship competition in the sport of CrossFit.

we are interested in we can also study professional fitness athletes gaining a lot of additional insights into analytics, tracking, visualizing fitness data, and coach/athlete remote collaboration.

One of the core tenants of CrossFit is making the training program as accessible as possible even in the case of someone having a disability. This results in the requirement that a design framework for remote coaching of CrossFit athletes be accessible to everyone. At the sport level of CrossFit there are elite athletes with both physical and mental disabilities in the adaptive divisions of the sport. These athletes as well as their coaches would be a great source of insight into, not only about remote coaching, but coaching of disabled athletes in general.

3 CROSSFIT+HCI: A NEW PROJECT TO DEVELOP A DESIGN FRAMEWORK AND PLATFORM FOR REMOTE COACHING OF CROSSFIT ATHLETES

Given the considerations described in the previous section we now introduce the CrossFit+HCI Project. The main goal of this project is to study open problems in the intersection of fitness training and HCI. The first open problem we are investigating is, what is the proper design of remote-coaching platforms for CrossFit?

In order to answer this question, we must answer four main subquestions: 1. Is it possible to strengthen the coach-athlete collaboration when remote coaching through design? 2. How do we define what a fitness movement is, how should workouts be programmed by the coach, and how do we track performance over time? 3. Can the platform be designed to be easy to use for new athletes, but powerful enough to be useful for elite athletes? 4. How do we design the platform to be accessible for those athletes in the adaptive divisions? We are making progress on 1 and 2.

1. The Coach-Athlete Collaboration. Perhaps the main question of any research in remote coaching is how can we make remote coaching as beneficial as in-person coaching of athletes? Surprisingly, coaching is bidirectional, coaches, the domain experts, aid athletes in bettering their performance in their fitness domain, but athletes must also take part in this process by self identifying/strengthening weaknesses, applying previously learned corrections, and offering ideas for future growth. This bidirectionalty is why we call the coach-athlete relationship a collaboration.

There is a theory within the field of fitness coaching known as *correction* whose main goal is to understand the detailed interactions between coach and athlete [2]. For example, the literature shows that in-traditional coaching that the coach largely identifies the main weaknesses the athlete needs to strengthen, and the athlete only self corrects already identified weaknesses. The theory of correction as only been applied to traditional in-person coaching, and has not been extended to remote coaching. We are creating a contextual design study to extend the theory of correction to remote coaching by interviews and observing CrossFit athletes, Olympic Weightlifters, and remote coaches in these areas. The main questions we plan to answer with this study are the following.

1. What is the role video plays in the coach-athlete collaboration? We conjecture that video plays a key role in correction and is essentially an extension of both the coach and the athlete. The design of a video client for remote coaching could enhance the identification of weaknesses, assessing progress, and even self correction by the athlete.

2. How do the coach and athlete communicate and record and analyze their progress over time? Since we are studying remote coaching most likely this is some digital platform. How is it used? Do both the coach and the athlete have permission to modify the data? Do they reassess long-term data? Are video stored in the same location? Are they concerned at all about privacy of their data? Through visualizations, task analysis, and incorporating the video framework discussed above we conjecture that design could also be used to enhance this area as well to make coaching easier, more enjoyable, and even more in-depth.

2. What is a movement anyway? Ultimately, we will be creating two major artifacts using the studies from this project. The first is a design framework others can use to design remote coaching platforms. The second is a remote

coaching platform called YTJ for Your Training Journal. One core goal of the YTJ platform is the ability to visualize, analyze, and track every aspect of a fitness program across all the areas of CrossFit. In order to accomplish this goal we have to be able to capture the abstract structure of a fitness movement. The following definition of a fitness movement captures the abstract structure of any movement:

Description	Notes	Labels
A simple explanation of the movement.	Useful information about the movement.	One or more tags for organizing and searching for movements.
Targets	Iteration	Scalars
One or more focus areas the movement targets.	A quantitative total describing the amount of work the athlete must do to complete the movement.	One or more additional factors that affects the difficulty of completing each iteration.
Measures	Submovements	
One or more inputs the athlete must record after completing the movement.	One or more movements that must be completed at some point during the parent movement.	

This definition should be read as a data structure or database table where each cell in the table is an attribute of a movement. We synthesized this definition by studying the training programs of athletes in CrossFit, Running, Rowing, Swimming, Boxing, Yoga, Olympic Weightlifting, and Body Building. This definition encompasses the structure to both describe a fitness movement and track an athletes performance when completing the described movement. Perhaps the most surprising attribute is that of a submovement, but there are a number of fitness movements with submovements. For example, running 5 kilometers, but every 3 minutes completing 5 burpees. The burpees are submovements to the parent movement of running.

4   CONCLUSION: THE NEXT STEPS IN CROSSFIT+HCI

We are currently designing a contextual design study where we plan to interview remotely coached CrossFit athletes and their coaches. We plan to include athletes with a wide range of skill level from novice athletes to elite athletes. In addition, we plan to study non-remotely coached athletes and coaches who do not use software to track their training. We believe studying such a group will give insight into how to make remote coaching platforms more enjoyable.

All of our research will be implemented in a digital training app called YTJ for Your Training Journal. We have already implemented the basic infrastructure of the app and will be basing its design off of our contextual design study. Furthermore we plan to investigate the use of machine learning to automatically scale workouts and enforce training periodization through analyses and communication with the coach and athlete. Finally, since training programs require the completion of tasks we will be studying how task analysis can be used to improve this experience.

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