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[An Exploration of Social Fitness Goals Through CMC]

A HCI/UX centered research analysis detailing how we can provide a solution to coordinating physical activities/gym schedule with a friend or with a group of friends

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Abstract

This paper takes an in-depth look at the nature of social fitness and methods with which a prototype can be created to help facilitate social fitness. The study is mainly composed of two primary facets: a prototype and procedural studies regarding this prototype. Before honing in on these, we took a look at existing literature which largely concerns existing fitness technology and incentives for greater fitness. Our literature review highlights the importance of the social aspect of fitness apps and the need for app flexibility (especially regarding communication, customization, and inter-app interactivity) to help incentivize greater exercise. From here, utilizing this collection of information, we have designed preliminary survey questions about user demographics, desired features, and user preferences. The results of these will then drive forward the design of our prototype along with subsequent usability testing and post-experiment surveys regarding this prototype. These tests and surveys will themselves focus on three metrics: "Productivity", "Difficulty", and "Satisfaction". Additionally, due to the current COVID-19 pandemic our user surveys, prototype, and usability testing will incorporate an exploration of social fitness under social distancing conditions. Ultimately, because of the situation, this test has not been actualized and results have not necessarily been discovered. Instead, this paper lays out the framework and planning for future experimentation regarding social fitness applications.

An Exploration of Social Fitness Goals Through CMC

Smartphone applications related to fitness and fitness goals are growing in popularity and being widely used in all young adults, especially during times like COVID-19 pandemic, due to their sensitivity of their body weights and concerns of their physical health. There are currently more than 1,000 fitness-related / exercise-scheduling applications for smartphone devices present on the market. These applications provide a range of various features, from providing motivational quotes and messages to its users to tracking their daily physical activity. However, it appears that there is less focus on analyzing whether these apps can also encourage social interaction and relationships between users. If the user was to plan a workout session with one of their friends at the gym, would they be able to plan their shared schedules? Also, would computer-mediated communication tools effectively support this scheduling process and help users to create new or maintain existing social relationships? With the goal of finding out whether CMC can facilitate socialization through an exercise scheduling application or extension, our project focuses on conducting a deep and thorough HCI/UX centered research analysis detailing how we can provide a solution to coordinating physical activities/fitness schedule with a friend or with a group of friends. We also provide an experimental procedure that will address a CMC implemented tool for group coordinated fitness.

Literature Review

This application is by no means the first foray into the world of fitness apps, and it certainly won't be the last. As such, in order to adequately implement such a fitness app, it is extremely important to analyze any and all surrounding literature reviewing other fitness

applications to determine the best possible approach in order to maximize the app's effectiveness. Three main categories were determined as the key factors behind the successful implementation of a fitness app that required literature research, namely social motivation, influencing behavior, and usability testing. Although more articles have been reviewed than are referenced here, the most important and most relevant pieces of literature that have been selected center around these three main categories, allowing this application to be made with the most relevant studies in mind.

When it comes to social motivation and its use in assisting with long-term fitness goals, the most prevalent research appears to indicate that the key factor behind genuine social motivation includes a social element as the main motivator behind usage of the app. While it may be tempting to center the application around some sort of gamified approach that rewards users for reaching their fitness goals with an in-app reward, relevant literature states that such gamified approaches pale in comparison to social motivation, indicating that a successful fitness app cannot survive on gamification alone; instead, it has to incorporate some sort of social aspect as the main motivator, as this is often what results in long term exercise program adherence (Spillers & Asimakopoulos, 2014). Although social motivation may not be able to achieve a 100% long-term exercise adherence rate, it is still substantially improved when the concept of the app centers around a social function, indicating that such a method must be used as the core concept of this application. Encouraging social activities as a part of exercise motivation is especially key when considering the psychology of socializing; establishing a social group that exercises regularly as one of its main activities has shown to provide an additional piece of motivation which helps to develop a level of social desirability to one's friends in adhering to a

workout schedule, which is extremely successful at developing long-term adherence to physical activity (Ryan et al., 1997). Finally, it has also been discovered that out of all current fitness apps available on the market, after surveying their user bases, greater adherence to exercise programs was found in the apps that center around social elements, such as workout scheduling or workout milestone social media posts, as opposed to apps that center around more gamified elements (Li et al., 2018). In contrast to the success of social elements, gamified apps were found to lose their novelty and luster relatively quickly, resulting in a gradual distancing from the gamified workout plan that once motivated the app's users to adhere to the workout plan (Tu et al., 2019). From these articles, it becomes extremely clear that in order to achieve its goals, this fitness app must center around social motivation as a result of its track record with establishing substantially greater workout program adherence in the long term.

Although social motivation is a key piece of any successful fitness app with the goal of increasing long term workout program adherence, the behavior of the users themselves must also be closely studied in order to analyze more specific details as to how the app should be set up for the purpose of incentivizing long term behavior change. While it is notoriously difficult to influence users to adhere to a behavior change for substantial amounts of time, such change can be achieved through three key directions: implementing the ability to create multiple communication methods in an app, allowing the flexibility to relocate said communication across apps, and the ability to access functionality from other apps to assist with interactivity (Nouwens et al., 2017). This insight indicates that a degree of compatibility and flexibility is absolutely crucial in moving the discussion out of the app and into the real world, starting with interactivity and communication. In addition to this, interactivity with calendar applications and/or the

Google Calendar API proves crucial for fitness apps as a result of a combination of the smooth technical framework of the app as well as market research and user empathy, while harnessing the scheduling and reminder aspects of calendar programs that produce the most beneficial results (Mamatsashvili et al., 2019; Munson & Consolvo, 2012). When it comes to the specific type of socialization provided by the app, it was found that social facilitation techniques such as social comparison, social competition, social cooperation, and normative influence were capable of impacting behavior change and maintaining motivation to adhere to fitness goals, indicating that the app has a large amount of flexibility in terms of the possible social options offered to its users (Yoganathan et al., 2013). On the other hand, the gamified option of fitness apps fails to achieve such behavioral changes, as an example fitness app with gamified aspects was found to be limited in drawing any sort of substantial conclusions as to how closely workout adherence was impacted, reinforcing the choice that an effective fitness app must center around socialization as opposed to gamification in order to truly influence long term behavior (Chen et al., 2014). Alternative approaches, notably by FitBit, have attempted to influence behavior and workout regimens through cash incentives, to a varied but underwhelming degree of success; the cash incentives were found to be effective, but failed to make any sort of substantial impact past the duration of the incentives, with substantial drop-offs in exercise rates and workout plan adherence after the end of the six month cash incentive period (Finkelstein et al., 2016). However, FitBit was able to see substantial levels of improvement when incentivizing social exercise, especially in users who did not exercise regularly, indicating that social exercise and social implementations are key to maintaining workout regimens over longer periods of time (Sullivan & Lachman, 2017). From the aforementioned literature relevant to behavior change, it

becomes extremely apparent that an ideal fitness app would include flexible communication features that seamlessly integrate with calendars, as well as adequate social cooperation and competition features, in order to sustain positive long-term exercise routine behavior changes in the user base.

Studies of social motivation and behavioral change can assist in terms of what the app should attempt to build around, but all such work would go to waste without proper usability testing in order to optimize the app's features for maximum impact. In studying current fitness apps on the market, a number of features were found to be the most useful to their users, including the aforementioned features of a scheduling calendar, editing and writing, polling group members, and event scheduling, which gives a solid baseline as to what features are crucial to ensure the app is easily usable (Margulieux et al., 2016). Within these features, it may be important to include a degree of customization as opposed to a static prototype, as such customization has been shown to allow each individual user to help optimize the app for themselves, improving overall usability (Prenzel & Ringwelski, 2013). However, this research by no means replaces the need for individual app-specific usability testing and user testing with the app in question, as online collaboration requires a high level of collaboration processes that can only be proven successful through specific user research (Delavari et al., 2011). As such, it can be concluded that, in order to ensure the app's usability, a number of core features must be implemented with customization options, while taking specific user testing results into account for further modification and optimization of the app's interface.

As a result of COVID-19, this application was halted in its early stages of development; however, that is not to say that there isn't a major market for fitness apps during this

unprecedented time. Demand for fitness apps has skyrocketed, showing increases of 30%-35% relative to pre-COVID-19 levels of consumer investment, which is a trend so large in comparison to the remainder of the economy that such demand is expected to hold out well past the lifespan of the pandemic, as more and more fitness-minded consumers turn towards digital fitness as a means of staying in shape (Evans et al., 2020). From this, it can be concluded that a long term shift towards digital fitness is imminent, even when the gyms are forced to close, indicating the need for an app such as this one.

Hypothesis

Based on the extensive literature review we conducted as well as the discussion we held as a research team, a few key questions emerged.

The first question we wanted to research was whether the current technologies accounted for the social factor specifically in scheduling the meeting itself? As our literature review noted, social facilitation techniques were successful in influencing behavior, thus we placed the emphasis on the initiation and communication aspect via scheduling. Our hypothesis for this first research question is H_1: Users will find existing technologies inadequate for use in scheduling social fitness events. We came to this hypothesis through our literature review as well as our personal experiences. We found that though scheduling of social fitness experiences is possible, the technology failed to account for the specifics of the situation.

This brings us to our second question and hypothesis. What types of application styles would lend the most to facilitating social fitness planning? One thing we noted in our discussion was that current scheduling apps were highly textual as opposed to visual, this made them

flexible and usable in all sorts of different scenarios since you could include as much information as desired to specify. However, the downside we noted was that the fitness space would benefit from a visual component and catered categories. A fully textual application did not provide the ability to coordinate a multi-person fitness experience in a concise and straightforward manner. Additionally, as Prenzel & Ringwelski, 2013 from our literature review noted, apps with a high degree of customization as opposed to a static app, was better received by the users as it gave them the autonomy to cater to their own needs through the apps affordances. This leads us to H_2: Users will respond positively to features catered for fitness integrated into their scheduling apps coupled with a visual component.

Finally, the spring of 2020 has been heavily affected in nearly every single aspect of daily life by the COVID-19 situation. Social distancing has been an absolute imperative as a means to curb the pandemic and fitness, which often takes place outside the home and requires a schedule, has been massively disrupted as well. As such, we have seen an increase in usage of social connectivity apps and the creation of many fitness outlets to account for two major aspects that fit perfectly into our research project. Our question is, how has the demand for a fitness specific app changed, and what CMC enabled features will provide the best solution? In our discussions we find that much of our lives have been transferred to some form of application which leads to our final hypothesis H_3: There is an increase in demand for social fitness as well as CMC solutions due to the COVID-19 situation and these solutions will need to be catered to popular technologies such as Zoom.

Method

Our experiment design aims to serve two objectives: confirm the hypotheses laid out above that were affected by COVID-19 as well as identifying valuable pain points to further our HCI process of providing a CMC implemented solution for coordinating fitness activities. Prior research has largely focused on increasing fitness levels by expanding on application features that cater towards workout customization or gamification but our research focuses on using socialization as the main motivator for increasing physical activity. Our experiment will follow the process of comparing pre-existing market solutions with our design concept. Our process follows a user survey that matches participants' most commonly used solution for planning workouts with friends and their preferences which will in turn create a guideline for our design concept. Our design concept will then be examined against the participant's present solutions and identify whether our concept was able to alleviate the pain points that the users mentioned prior.

Design

This study will use a within-subjects design to conduct our user survey and usability testing. We chose within-subjects design so that we are able to compare each participant's performance on our two independent variable conditions. This study's independent variable is the number of people the participants are asked to schedule their fitness activity with. There are two conditions we will be testing using our prototype: the participants will be asked to schedule their fitness activity with one other person and also with a group that has more than two people. The dependent variable will be measured through a set of qualitative interview questions to measure how satisfied or user-friendly the participants feel about the prototype.

Participants

With the approval of our IRB application, we will use the SONA recruiting method in order to get participants for our experiment. The participants will be awarded 0.5 credits for the user survey and 1.5 credits for the follow-up usability testing. Our target participants are actively enrolled Cornell students that have prior experience in engaging in physical activity alone as well as with other individuals. It would be most favorable if the students have also tried to coordinate physical fitness with other individuals during the quarantine - workouts with appropriate social distancing, video-chatting workout, or possibly through phone call. There is no focus on specific genders and any Cornell students over the age of eighteen will be eligible for the experiment. We will first attempt to accumulate a participant group of 40 - 80 people for the user survey. After the collation of data with our user surveys, we will filter down to 20 people for the usability testing, in which their prior user survey results will match against their data from the usability testing.

Material

Due to the global pandemic, the entire experiment process will be digital. The user survey is a digital form that is accessed online and the questions that will be asked are about the participant's experience using digital tools to coordinate physical activities, so their reference point will also most likely be their phone or their laptop. They will be notified through email through the SONA system for the follow up for the usability testing. The usability testing will be entirely remote - initially proceeding with usability scenarios on mock-ups of an iPhone X shown through Zoom screen-share and then asking questions about their experience as they are guided

through these scenarios. The entire process will be digital and participants will never be asked to write anything. The experimenters will also only be using digital equipment, specifically, a laptop for transcribing the participant's responses.

Equipment

The participants will be given no equipment for the user survey portion. The user survey will be conducted through the Qualtrics platform. The participants will be able to access this survey through nearly any device on any browser with internet access through a link from their SONA account once they are granted access to the experiment. Furthermore, for the usability testing, the participant will also not be given any equipment. The participant will be interviewed through a Zoom call, where the interviewer will guide them through the design concept by screen-sharing the prototype mockups created. The designs will be mockups on an Apple iPhone X and the mockups shown will have dimensions of 1125 x 2436 px. The mockups will be shown for about 50% of the usability testing session and then the session will resume back to a personal video chat for a follow up interview.

Procedure

The experimental procedure consists of two parts, the user survey and the usability testing. The user survey will be conducted via an online Qualtrics survey (Appendix A). Participants will be able to sign up to participate in the user survey and access the Qualtrics form through Cornell University's SONA system. The user survey will first consist of an online consent form. The participant will be able to read through the consent form and indicate their

consent to participate in the experiment by continuing with the survey, as clearly stated on the page. The first part of the user survey will collect general participant demographics, including age, gender, school year, college, major/program of study, as well as study-specific demographics such as how often the participant works out or does physical activity in general and with other individuals. The next part of the user survey will ask the participant to describe their physical activity patterns and behavior. It asks how the participant currently schedules physical activity with friends or other individuals, what the participant dislikes or finds annoying when trying to schedule fitness with friends/others, if the participant does not work out with others, the reasons behind them not doing so, as well as whether the participant believes that scheduling fitness with friends or others increases their frequency to do physical activity throughout the school year. The survey will also ask participants a series of questions on physical activity since the COVID-19 outbreak, given the unique circumstances of stay-at-home orders and fitness facilities being shut down. The questions include if and how the participant does physical activity, which, if any, technologies or online platforms they use to do physical activity, and if and how they schedule remote group fitness activities with their friends. In the following portion of the user survey, the participant is given two scenarios to respond to. The participant is asked to describe their response with as many details and steps as possible. The first task is to schedule a workout with one other friend without being able to see or communicate with them in person before the meet up, and the second task is to do the same, but with a group of friends. The tasks ask the participant to especially focus on detailed descriptions of how they might use technology to help with the planning. Finally, after the scenarios, the participant is asked to rate qualitative measures regarding their experience with scheduling fitness with others. The

questions cover success of performance, various emotional responses in completing the task, and satisfaction with the current method(s) of scheduling fitness, rated on a scale of 1 to 7.

After the user survey, we will collect the participants' responses, especially regarding the currently used methods of scheduling fitness and participants' perceived difficulties or frustrations with these current methods, to create a prototype for a mobile application. The mobile application will allow for users to communicate with each other as well as provide features specific to scheduling and fitness activities. The prototype will also enable users to do group fitness activities remotely through means such as connecting to applications such as Zoom, or introducing an internal group audio and video call feature. A mockup of a potential prototype is provided in Appendix B.

Finally, the latter part of the experiment consists of a usability testing of the prototype. Participants will be able to sign up for the usability testing on SONA, but the usability testing will have a prerequisite that the participant must have previously completed the user survey. The usability testing will be conducted over Zoom. In the beginning of the usability testing, the participant will receive a consent form to read and verbally agree to. The usability testing will include two scenarios. The two scenarios will be identical to the ones in the user survey, scheduling fitness with one other friend and with a group of friends, but will be completed on our prototype. After completing the scenario tasks, the participant will assess the same qualitative measures that were provided in the user survey, covering performance success, emotional responses to conducting the task, and satisfaction with the prototype in completing the task, as well as an additional question measuring the participant's level of preference for the prototype over existing methods of scheduling fitness. Finally, the participant will be asked a series of

questions on their experience with the prototype in a follow-up interview. The participant will be asked to elaborate on points of confusion or frustration while performing the tasks, which feature(s) they felt was the most useful in completing the tasks, and which feature(s) they felt was missing from the prototype.

Measures

We will be using three qualitative measures to assess the success of our prototype in better facilitating fitness scheduling using CMC.

Table 1. Qualitative Measures

Measure	**Explanation**	**How it is calculated**
Productivity	Productivity is measured based on participants' perception of the tool's performance. The performance measure is how successful the tool was in accomplishing the goals of the tasks.	Likert scale of 1 (lowest) to 7 (highest)
Difficulty	Difficulty is measured based on participants' perceived difficulty while performing the task. Perceived difficulty will be measured by asking the participants to rate their perceived level of various emotions:	Likert scale of 1 to 7 for each of the emotion listed

	insecure, discouraged, irritated, stressed, annoyed, secure, gratified, content, relaxed, and complacent.	
Satisfaction	Satisfaction will be measured using two variables. For both the user survey and the prototype usability testing, the participant will be asked on their perceived satisfaction with their experience using the tool. After the usability testing, an additional variable of preference will be used to measure satisfaction, for which participants will be asked how likely they are to use the prototype over their current methods of scheduling.	Likert scale of 1 to 7 for each variable

We will also be assessing participants' overall experience in using the prototype compared to using their current methods of scheduling group fitness based on their comments and responses in the follow up interview. Based on their perceived points of confusion or frustration, useful features, and missing features, we will be able to gain insight into aspects of CMC that participants value the most in scheduling fitness activities with friends or other individuals. Through a combined evaluation of the qualitative measures and participants' personal

perceptions of whether and how much the prototype complies with their desired characteristics, we will be able to measure the success of our prototype in providing an effective CMC tool to schedule group fitness activities.

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