

KineoGuard: A Platform for Exercise Injury related Health Professionals, their Clients and Sportspeople

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1. INTRODUCTION

Muscular injury is a common risk in daily life, whether from exercise or simply moving around as part of a daily routine.

Many people, specifically those who engage in exercise, would prefer to take steps to prevent this while others - even with preventative measures - may still need to eventually see a Physiotherapist, Kinisthesiologist or Professional Trainer (Health Professional) for rehabilitation.

Our vision is to improve access for people to stretches and massages and provide a platform for easy interaction between Health Professionals and their clients. To address this issue we have designed the application, KineoGuard, which provides a repository of stretches, massages and other muscle exercises (Movement Exercises), validated by Health Professionals. It additionally provides the ability for Health Professionals to interact with clients and provide them with personalised Movement Exercise Routines which include video and textual demonstrations to improve the rehabilitation experience.

The areas of focus for KineoGuard were informed by the interviews conducted with potential users during the first iteration of the design. Results from said interviews allowed us to reduce the scope and improve the vision for KineoGuard to properly address the issues that potential users have encountered when looking for Movement Exercises. Through user evaluations with target user participants, fellow Human Computer Interaction Students and Health Professionals we have made appropriate additions to our current iteration of the design.

2. BACKGROUND

Musculature injuries are an accepted part of life and often are not treated due to a lack of resources, unreliable online information, a lack of access to Health Professionals and more. Anecdotally it is accepted that many people do not follow through on rehabilitation programs as eventually it becomes too much effort to keep doing.

As of 2019 there were 7937 actively registered physiotherapists to manage the rehabilitation requirements of a South African population of 58 780 000. This translates to roughly 1 physiotherapist per 7500 inhabitants. The ability to reach the population is also exacerbated by a lack of rehabilitation centres in the public sector [1]. Based on the statistics above, this project focuses on making access to Movement Exercises easier for all people who have access to a smartphone, and improving the experience of rehabilitation through a Health Professional while

aiming to help increase the follow through rates on rehabilitation programs.

2.1 Related Work

As our subject of research is a mobile application for use by Health Professionals there are not currently many related research materials in this exact field. One such application, however, is 'MyPhysioApp', which has been designed by Cowan [2]. In Cowan's words: 'MyPhysioApp is an app that allows you to send exercise programmes directly to your client's mobile device'. The exercises in these programmes are presented to the user as a photo or video of an expert performing the exercise. It also allows users to set alarms to remind them to do their exercises. In order to prescribe an exercise, the physio logs into MyPhysioApp online, enters their client's details and selects the exercises they wish to recommend to their client from a list of over 550 exercises. The physio then sends the client an email or sms, where the client is given a link to download the app and a second link to add their exercise program on the app. Although quite similar, MyPhysioApp differs mostly from KineoGuard in the following:

1. MyPhysioApp does not have the "compare my form" feature where the user films themself and watches a side-by-side video of their form compared to the correct form.
2. MyPhysioApp has its own database of exercises that a physio can choose from, and if the exercise isn't there, the physio can add the exercise to the database by filming or taking pictures of him or herself.
3. MyPhysioApp allows the physio to select exercises, specifying the number of repetitions, sets, and duration of reps when creating a set of exercises. This detail was not specified in the KineoGuard prototype.

3. METHODS

The KineoGuard app was developed from a user centred perspective in an iterative process. The application was first brainstormed by the project team before beginning research on the true requirements of the users.

3.1 Interviews

Each team member performed remote interviews with 3-5 participants. The remote method was selected due to Covid-19 safety issues. Participants were selected based on their level of activity and their type of exercise to cover the full range of potential users. People who exercise frequently and at a high intensity were chosen due to them having a higher probability of

experiencing injuries and they could provide insight into the common issues they have faced when attempting to find assistance with their injuries. People who exercise fairly frequently and at a low level of intensity were chosen to provide insight into how someone who may not be as experienced with exercise terminology and their bodies would fare with finding help and advice in the case of an injury. Within this exercise range we also selected participants with a variety of reasons and methods used to exercise as these various mindsets often produce different reasons for how injuries would be approached. A total of 17 interviews were conducted. From the participants' self-reported fitness levels, 3 participants rated themselves to be of high activity, 1 participant rated Medium-High, 8 participants considered themselves to be of Medium fitness level, 2 were Low-Medium, and 3 Low. The results are summarised below.

Low	Low-Medium	Medium	Medium-High	High
3	2	8	1	3

Figure 3.1: Self-Reported Participant Fitness Levels

Interviews began with the participant being informed of the project's purpose and how their responses would be used to ensure complete transparency. All participants were informed of their right to refuse to provide an answer to any question and consent was acquired to make use of the responses they provided for the development of the prototype. The interviews were conducted with the interviewer asking the participant an agreed upon list of questions (see Appendix A), with the liberty to enquire upon interesting or unexpected answers. All participants were asked the same set of questions regardless of their activity level.

The goal was finding out how the idea of the KineoGuard application could fit into a participant's life. To that end we asked questions about exercise habits, frequency of exercising, time and structure of their exercise routines, how they used their phones in relation to their exercise, the prevalence of injuries in the participant's exercising, their feelings and attitudes towards Artificial Intelligence (AI), their experience with searching for treatment themselves and how their experiences have been regarding getting treatment with a health professional for sports injuries.

At the end of an interview, each participant was thanked for their time and informed that the application would not be fully developed due to the nature of its development as an Honours Module Project. After the interviews each team member conducted an analysis to produce findings which would be used when designing the first prototype of the KineoGuard application.

The choice to make use of only interviews instead of additional methods such as the contextual inquiry [3], which is often cited as being highly useful for gathering initial requirements from a user, was due to the Covid-19 pandemic limiting the safety of in-person data collection. Therefore the team was limited to methods which could be conducted remotely such as an interview or a survey. Interviews were chosen over surveys due to the advantage of being able to probe deeper when interesting answers were given and the ability to provide clarity should a question confuse a participant.

Each participant provided us with useful and unique perspectives on an application designed for self diagnosing injuries. This allowed us to make important design decisions in the first iteration of the design process. Time constraints and Covid-19 limited the ability for the team to find and interview participants outside of our own social circles. Participants were more likely to have more similar backgrounds and social statuses than would have been preferred. This limited the range of response we could get about how the KineoGuard application may affect others in different situations to our own.

An additional factor that may limit the quality of the information gathered would be our lack of experience. As Honours level HCI students we do not have the necessary experience or knowledge to conduct these interviews and the subsequent analysis without the possibility for significant errors to occur.

3.2 Prototype Design Process

The KineoGuard prototype was developed using an iterative design process. This allowed us to constantly update and change the prototype based on feedback received at different stages in development.

The initial prototype was created during an HCI Lab organized by the course convenor. Due to Covid-19 constraints, these were also conducted digitally through the platform, Gather. The initial prototypes were developed using online drawing tools in the style of a paper prototype as this allowed for rapid prototyping and forced us to come up with ideas without wasting a lot of time thinking them over. [2] The paper prototypes were first developed separately allowing us to focus on the unique aspects that were highlighted from our own interviews before coming together to identify common themes and collaborate on a second iteration which incorporated ideas from the entire team.

Due to Covid-19 the third version of the prototype was designed on LucidChart, a digital creation collaboration tool, in the style of a low fidelity paper prototype.

The first heuristic evaluation of an in-progress version of the third (low fidelity) iteration of our prototype was conducted during a follow up HCI Lab by fellow HCI Students. After receiving the feedback from our fellow students the prototype was presented to the entire class and the course supervisor and additional feedback was provided by both parties. The feedback provided during this session was used to direct further development on this iteration of the prototype along with leading to a reworking of certain features.

We made use of a usability test to cheaply and easily test the prototype. This method allowed us to get feedback directly from target users of the KineoGuard app which is an advantage of the method. Due to Covid-19, the tests were conducted remotely using Invision rather than in-person. This had multiple disadvantages due to the low fidelity nature of the prototype. The specifics of these disadvantages will be discussed in Section 3.3.

3.3 Prototype Evaluation Process

Once the third prototype iteration was complete, using the feedback from our interviews and the the HCI Lab heuristic evaluations, we made use of a usability testing method [3] to gain insight into our current prototype from both the original target users, people across a range of activity levels, new target users and Health Professionals.

A total of 8 evaluations were conducted with the participant demographic split such that 2 were original target users who had

never attended a Physiotherapy session before, 2 were original target users who had attended Physiotherapy, 2 were Physiotherapists and 2 were fellow HCI students. These participants were selected from among fellow class members that we did not have close association with, members of our original interview participants as they already had context for the prototype and from general enquiries to find willing physiotherapists. Due to time constraints the Physiotherapists were both recent graduates who were doing their community service as physios in government hospitals. The effect of this choice on the results of their evaluations will be discussed in the Discussion/Analysis section.

Evaluations were conducted using online video calling software, Zoom and Microsoft Teams, depending on the preference of the participant. At the beginning of a call the participant was informed of the intent to record the evaluation and make use of their evaluation in this report. Their consent was acquired before proceeding. Each evaluation began with a brief background on the KineoGuard app, an explanation of the purpose of the evaluation, a clear description of what aspects of the prototype we could and could not explain to the participant and a layout of the stages of the evaluation. This was followed by a set of pre-evaluation questions to establish the participant's competency with phone based apps, a 5 to 10 minute time interval during which the participant could freely use the prototype unassisted to simulate downloading the app for the first time, a task completion section wherein we would provide the participant with specific tasks to complete in the prototype and lastly a debriefing session to get an overall impression of the user's thoughts and experiences with the prototype. During the exploration and task completion sections the participant was requested to dictate all their thoughts and actions as they interacted with the prototype to help provide feedback that may have been forgotten by the time of the debrief. An overview of the Evaluation Structure including the Tasks and Debriefing questions can be found in *Appendix B and C*. The feedback received from these evaluations was then used in the designing of the final prototype as discussed in Section 6 of this paper.

The methods used in this study were appropriate due to the low fidelity nature of the prototype and our desire to get feedback from real world user's of the prototype. By making use of Invision we were able to successfully implement the spirit of a paper prototype test remotely by allowing the participants to use an interactive prototype and thus engage with the prototype as though it were physically in front of them. As mentioned in Section 2 there were significant drawbacks from this method as well. Due to time constraints and the need to design the prototype online taking longer than paper prototyping not all screens in all variations could be completed which led to confusion for participants that otherwise would not have been present. Additionally as we could not code transitions that would be conditional in Invision we had to make choices on which variation of certain screens to display which also led to confusion for participants. Due to this some issues highlighted during the evaluations are likely due to the limitations of doing a remote evaluation of a paper prototype and consequently may have overshadowed true functionality issues that would have been identified otherwise. Connection issues also presented a problem where not all evaluation session recordings were completely clear and thus led to incomplete transcripts for use in the analysis although this was minimized by having additional team members observe all evaluations and take notes during the process.

4. FINDINGS

4.1 Interview Findings

Artificial Intelligence

Most participants said they didn't keep their phones with them while exercising, although a small minority used smartwatches to track health data. Overwhelmingly, participants were familiar with and trusted AI, but were skeptical of AI being used to diagnose an injury or create a treatment. A recurring theme when talking to participants was that they sometimes avoided going to a physiotherapist when they had an injury, sometimes due to financial difficulties and other times because they had experiences of going to a consultation with a physio only to be given a printed sheet of movement exercises that they could have obtained online themselves.

Gym and home workouts

Due to Covid-19, some participants have stopped going to the gym. They have adapted and started to use home workouts. One user said that they get their workouts from YouTube. They would like to have a larger variety of exercises and the ability to create her own routine. Many participants, especially those who were more physically active (dancers, swimmers), responded very positively to having massages and stretch routines on the application. Another participant who is a medical professional added that it is important that the instructions are very clear as doing the stretches incorrectly could cause further damage, "as long as they know that you need to stop when the stretch is hurting, not pulling". Notifications to exercise were also received well, with one participant stating that they often forget to do the stretch routine that their coach prescribes them.

Diagnoses and medical professionals

One of the participants, who studied physiotherapy, when asked whether KineoGuard would add value stated, "*Yes (if full diagnosis was made in person and follow ups are regular), it will save time making an appointment, getting there, and waiting one's turn*". Another participant claimed that since they exercise so often and as a result have become very familiar with their bodies, and therefore would prefer using this application to save money instead of visiting a medical professional.

Access to medical professionals

Participants liked the idea of having direct access to medical professionals.. They said it is difficult and often unclear how to find the correct professional in life, and having information easily accessible would make them more likely to use the application. They also felt that if a professional was on the application, that that was a sign of endorsement, and added a layer of trust between the user and the application.

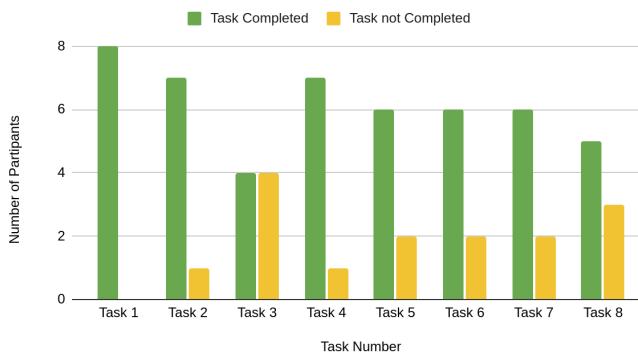
Augmented Reality features

Some participants were unfamiliar with the concept of Augmented Reality. But those who were familiar had a net positive response when asked how willing they would be to track their exercise movements using AR. "... *I am constantly worried about my form when I am working out. Having an app that could correct me would be amazing.*" and another responding "*Yes, most of my home workouts came from YouTube last year anyway. I just need to make sure I follow the correct form so I guess that's where your app would come in handy.*" The interviewees responses do reinforce that this could potentially be a highly marketable feature

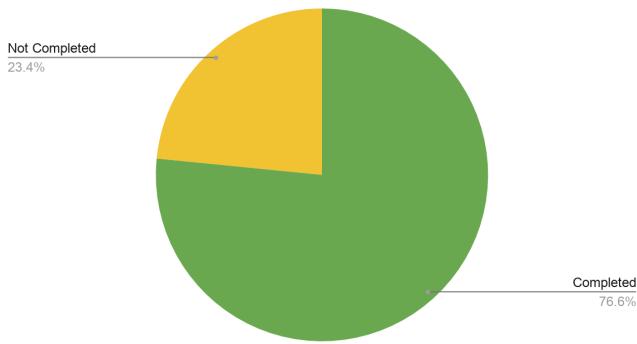
but as one interviewee mentioned, “... *As long as the app is not clunky, and gives me actual suggestions how to fix my technique.*”. Importantly though, the professional interviewed warned about including this feature, since incorrect movements can cause injuries and may bring liabilities as well.

4.2 Evaluation Findings

Number of Participants Completed / Not Completed per Task



Successful Task Completion



4.2.1 Overall Participant Feedback

The general feedback provided of the application from a holistic point of view.

Explorability and Ease of Use

Participants often expressed that the prototype appeared complicated and confusing at first. After the exploratory session they found that most of the initially foreign and confusing features became clear to them. One participant said of the prototype, “*Playing around with the app helped, becoming familiar with the different options and where to go. I would say initially, it wasn't the easiest to work around, but once you become more familiar with the app, it becomes quite user friendly.*” and another said, “*Yeah, it felt so easy. At the beginning, it felt a bit foreign. But after five minutes of using the app, everything is plainly set out and it tells you where to go, and how to do things.*”. Contrarily, some participants found that elements of the prototype were not easily explorable and that their placement didn't make sense, “*Sometimes, there's too many clicks to get to a specific place. [...] So to get to the calendar, you have to go to your routines and then go to the calendar. And then this is only for today.*”.

Accessibility

Some participants pointed out that the application may be inaccessible to older demographics due to the similar layout to social media applications which that demographic often have trouble understanding, “*I'm not sure about an elderly individual, who's 50 years plus, because I would say we're quite proficient in using apps, but somebody older might be a bit confused.*”.

Additionally, it was pointed out that the application may be less accessible to those in poorer areas where smart phone access is not as widespread, but that the application would likely be highly accessible to a private practice within a city context, “*I'm thinking in a rural sort of setting. I don't think a lot of your people evaluating this app are in this kind of setting. So most of my clients don't have smartphones to have access to an app like this. But in the ideal private practice world, where your client base would likely have a smartphone, I would prefer this but I think it's dependent on where you're situated.*”.

4.2.2 Participant Feedback by Feature Set

Feedback for specific feature sets within the prototype.

4.2.2.1 Dashboard

The three blocks for “Suggested Movements” at the top of the Dashboard caused confusion in some participants as their purpose was not completely clear, “*There are three random movements. I don't know what those are meant to be.*” and “*I didn't have a clue what the purpose of the three blocks were*”.

One participant thought the inclusion of your preferred Health Professional on the main screen took up too much space and was unnecessary, “*I think the doctor is taking up precious real estate. I've got my physios details on my phone, I don't need it in an app...*” and that the text on the Routines panel was confusing, “*I was a bit thrown off by the 'you have four movements to complete today', and then 'view routines'*”.

The majority of participants did not have major issues with the Dashboard and found it suitable while one participant did enjoy the Dashboard saying, “*The home screen is laid out in a familiar way of large tiles and different sections*”.

4.2.2.2 Inbox

A common response from participants indicated that the Inbox symbol on the Dashboard is not clear. Once a participant opened the Inbox, it was clear what the purpose was, “*I'm clicking the button on the bottom left hand corner. I'm not really sure what it does. It takes me to my inbox*”. One participant suggested renaming Inbox to Conversations . The term ‘Inbox’ has a close association with emails creating confusion whether this was messaging within the prototype, “*I wouldn't have thought that the name inbox would be related to a conversation. I related more to an email rather than a conversation[...]*”.

Some participants confused the Inbox and the ability to search for Health Professionals they'd have previously contacted with searching through all Health Professionals within the application,

"If this is a patient's app then I would tell them to go to this button and then find the medical professional there.."

Many participants did not find major problems with using the inbox or its layout with one commenting that, "...it's quite a nice, easy format to understand".

4.2.2.3 Profile

Due to the standard nature of the profile screen resembling many common profiles in other applications there was not any significant feedback from participants.

4.2.2.4 Health Professional Profile

Most participants found the health professional profile to be satisfactory with the map displaying the location of the practice being highlighted by some, "...as well as the practice address, that's quite cool. I think that covers all the relevant details.". The inclusion of a rating system to show how highly other users rate a Health Professional was also received positively, "There's also a rating system. And that's cool".

One participant found the tags did not offer a clear affordance as clickable, "I wasn't expecting to be able to click on them." while another found them to not make sense saying, "Very few physios specialize in a certain focus area". The validity of this claim, however, is questionable as this participant, although being a regular physio client, is not a physiotherapist himself. Some participants also said there was a lack of clarity in where to find Health Professional prescribed routines as they attempted to find them here, "Since there's physios assigned to me, I'd assume that anything they assigned me would be under their profile"

4.2.2.5 Movement Name and Compare My Form

Participants had issues with some of the functionality on the Movement Name screen not being immediately obvious. Examples include the "+" button used to add a routine to a movement, "...it's not related to instructions, but it's adding it to a routine or creating a new routine." and the ability to use the Compare My Form feature, "Does not appear obvious to click "Compare my form" to view seems better if it was immediate". Additionally it was pointed out that it would be useful to add sections recommending a repetition count or time to hold for each Movement Exercise, "When it's stretches, it will be how many minutes or seconds you should hold the stretch. When it comes to strengthening that will be the dosage and how many times they should do one set and then how many times they're going to repeat that set. I think that it's important to put in somehow."

Once the participant understood the functionality available on the Movement Screen they had positive feedback regarding all that was available especially the multiple methods to see how to perform a movement as one of the Physiotherapists said, "The best thing is that it has a visual representation of the specific movement, it highlights the areas of focus and it leaves a space for thorough instruction. Overall, that is the best in terms of the routine, that would help the client understand what to do."

Many participants had issues being unsure how to position the camera before starting to record themselves for the Compare My Form feature, "I'm not entirely sure whether I should have filmed side on, front on or anything like that and also properly matchup against actual videos", not knowing which figure was meant to be them versus the professional, "I'm not 100% clear which one is supposed to be me.", questioning its usefulness due to the difficulty to set up the phone to record themselves, "I can see myself having to find a way to prop my phone and then take the recording. I don't think I'd ever use it if I'm being blunt." and having an issue with the amount of transitions needed to use the feature, "Also, instead of taking you to new pages consistently, it's like one page, two page, click, and then click again."

Contrarily, some participants found that while setting up the phone to record may be annoying, that the usefulness of checking their form would outweigh any frustration, "It would require effort, but if it's for your own benefit and it's actually going to help you. You need to be willing to do that small sacrifice." Additionally, one of the Physiotherapists mentioned that there should not be issues of people getting injured due to comparing their own range of movement to a professional's in the Compare My Form feature, "...in terms of utilizing videos with people that are different in size, or shape or whatever. I don't see it being an issue. I think, as long as they're just ergonomically correct, and the joints are all aligned and how it should be demonstrated, I think it doesn't matter."

4.2.2.6 Routines

Participants liked that routines allowed you to set reminders and schedule a routine for multiple days, thus they would not forget their stretches, "The best thing about creating the routine was that it sends you a reminder and you can do it for every day that you need to. You don't need a separate routine for every day"

Many participants had issues with the functionality of the routines page. One participant, when trying to find a new movement, was confused, "The search 'movements' looks like a movement itself, rather than a search bar.". Other participants had issues with the wording on the screens, "I'm not sure if it's here to repeat the routine. I think it's because of the way it's written.". Some affordances were not clear, "I don't know if it's intended to be able to shuffle things around." and "When you click Edit, does it let you edit the name of your routine?". One participant found the entire routine system unintuitive, "...it's a bit clunky to be honest.". Additionally it was not clear how to tell which routines are Health Professional prescribed versus a user's custom routines, "...have a little insert in the top left corner saying, like my routine, professional routine, something like that, just to differentiate.". When asked to find a routine they had made for a task some users were unsure where to find these showing it wasn't obvious where they would appear in the app, "I will assume that I could see my routines inside my profile.".

4.2.2.7 Search

Participants praised the limb selection feature for allowing users of all knowledge levels to easily search for stretches without needing to know the name of the muscle they wanted to stretch, “*Okay, that helps. Not everyone knows the different muscle groups or joints.*” and “*I like that if individuals don't know the name of the muscle, then they can hover over the certain body part. Having the visual representation was really good.*”. One participant suggested having the limb selector as the only search method, “*I like the limb selection thing. You can literally just go remove this whole page and go straight into this.*”. The use of a magnifying glass to signify the search functionality was welcomed as it made it easy to recognize, “*I liked that the icon is obviously very easy to understand.*”.

Some participants did not realise that the Focus Area Tags and Limb Selector were available as search methods, “*So initially, looking at that, I didn't think that there were three different ways of searching. I just initially thought, okay, I must tap in the search bar, and then I must click focus areas, and then I must do that*”.

Additionally the use of one search bar for searching both Movements and Health Professionals was more often confusing than a good combination, “*I think it's just two completely different things like muscle groups or medical professional, whereas I think this entire search screen is focusing more on the muscle groups and that kind of disregards the medical professional, if that makes sense.*” and “*So with how much of it is dedicated to muscles, I kind of filed it off as just searching for muscle or movement*”. One participant also found that the “Apply Filter” button on the Limb Selector was not obvious to click, “*Apply filter button was not completely clear that it should be pressed after selecting a muscle.*”.

5. DISCUSSION/ANALYSIS

5.1 Methodology

The task evaluation allowed us to understand how users interact with our prototype design. The tasks prescribed were ones that encapsulated the core functionality of the application, and the feedback received from users helped refine the final prototype. This feedback included what users found difficult to use, what worked and other useful observations we were able to gather which informed our understanding of how the average user interacts with our application.

Evaluations had to be done online through screen sharing due to COVID-19 to limit social interaction. We were unable to monitor users’ facial expressions and eye movement while they were interacting with the application, which could have provided additional insights into users experiences [5]. Another problem caused by COVID-19 constraints was that participants were more likely to be a part of our social circles, since all communication was done online, which meant that they represented a more narrow range of users, and thus would not be a representative sample of the full target user base. [6] Additionally due to the physiotherapists being working individuals we could not get full time Physiotherapists to partake in the evaluation and so we got Physiotherapy students who were currently doing their community service to take part. This does slightly limit their feedback as they have not been practicing long to give a full idea of how the prototype may affect their working routine but they

had been seeing clients and so could give useful feedback regardless which is why it was decided to pursue this evaluation using these participants.

The prototype was also designed in a low-fidelity manner, and some of the responses from participants were regarding the appearance of the application which were going to be refined at a later stage.

5.2 Design

Original Concept Redesign

The original intended design of the KineoGuard application was to be a self-contained platform that would use Artificial Intelligence (AI) to diagnose injuries based on an extensive user profile containing all relevant medical information, but it was found in the initial interviews that user trust in AI within medicine is currently low [9] and thus the design focus shifted to providing a platform to improve the current rehabilitation experience between Health Professionals and their clients.

Fidelity Choice for Evaluated Prototype

The choice to create the evaluated prototype as a low fidelity paper prototype allowed us to experiment with a few different ideas for how functionality would work [4] but due to our lack of experience with lo fi prototyping, the time constraints, the lack of colour used in the prototype due to using online tools and the inability to conduct the evaluations in person due to Covid-19 it created many usability issues that we would likely have been able to avoid with either in person evaluations or a higher fidelity prototype. This issue often manifested as screens only existing in one permutation instead of all of them. Our findings support this as many participants struggled to understand many of the list based screens such as “Routines”, “Results Screens”, “Routine Creation” and more as they were only in one set permutation that wouldn’t always make sense for a first time user of a new application.

General Design Choices

The evaluated prototype was created using many icons and commonly practiced design methodologies. This was to give users a feeling of familiarity when interacting with the prototype. This was successful with many users remarking that the prototype while foreign at first became very easy to use after a few minutes of exploring it. Many users also appreciated the use of recognizable icons [8] to signify common application features such as the magnifying glass for searching, the house icon to return to the main page, a person’s outline to symbolize a profile screen and more.

Dashboard

The Dashboard was mainly well received and complimented for appearing very consistent with other commonly used applications but the three movement icons at the top of the screen were noted as being unclear in their purpose. The inclusion of the preferred Health Professional was due to our belief it would be a core use of the application and need to be accessed often but it was pointed out that not all users will be Health Professional Clients and this Health Professional will also be easily accessible through the User Profile or the Inbox which supported the point that it may be a waste of screen real estate.

Search

Using one general search bar for both Health Professionals and Movement Exercises proved to be a mistake as many participants struggled to know where to search for Health Professionals as the focus of the search screen's additional search methods were purely on searching for Movement Exercises. The affordances for searching via the Focus Area Tags and the Limb Selector were not clear to some participants while others struggled to understand the use of these features but it is believed that they would be clearer in a higher fidelity prototype. The affordances of these features should be improved as once informed about them many participants did appreciate and find them to be incredibly useful.

A problem that was found in the evaluated prototype was that when users clicked on the search bar, they were immediately taken to the search results page, without the intermediary step of text being filled into the search bar. One participant didn't understand why the screen had changed, as it wasn't immediately apparent that the next page was a list of search results, due to the lofi nature of the prototype.

Movement Name and Compare My Form

The Movement Screen provided an unclear affordance by having the “+” icon which was meant for adding that movement to a routine next to the instructions heading which caused participants to at first assume this was used to add to the instructions.

The design of the Compare My Form feature as simply being a camera screen to show the participant what will be recorded was brought up as a possible issue as many participants were unsure what angle or orientation they should personally be at for the eventual comparison to make sense. For example whether they should perform a squat head on towards the camera or side on.

Routines

The Routine screen as mentioned in paragraph 3 caused issues as it was set up as though the participant already had routines saved as this allowed us to test the most functionality for the screen across all variations of it. Due to this we included only an edit button which would allow a user to theoretically delete entire routines or add new ones, but due to time constraints the removal of entire routines could not be shown and this took the participants directly to routine creation. This allowed us to see that exploration was quite easy within our prototype which we were designing for but also did point out that many participants would have preferred to still have a separate create button rather than embed it within the Edit when there are routines already created.

The lack of any visible differences in routines also confused many users when asked to open a Health Professional prescribed routine as it was not clear that they would all be on the same screen.

The Routine Creation screen was praised for being simple and intuitive once the single variation issue was understood but the design of the search bar was criticized for appearing too close to that of the movements being added to the routine. Additionally, many participants suggested renaming some of the scheduling buttons as the names were overly long and complicated.

User Profile, Health Professional Profile and Inbox

The User Profile, Health Professional Profile and Inbox screens all had very few complaints with only minor wording changes being suggested and so these will be reworked in high fidelity to similarly resemble their current iteration.

5.3 Proposed Changes

In light of the issues from Section 5.2 the following changes are being considered for implementation into the final application design. These are in conjunction with a shift to a high fidelity prototype which will hopefully reduce many of the errors, including dead ends and general glitches that were discovered during prototype testing and are not specifically addressed here. The shift to a high fidelity prototype will also include the addition of actual images in what were once plain bars and the use of colour over the black and white evaluated prototype. Additionally a colorblind mode will be added to the application to increase accessibility for all users [11].

Dashboard Changes

Clear labeling will be added to the movement blocks at the top of the screen to identify them as a user's "Suggested For You" movements.

The preferred Health Professional will be replaced with your currently prescribed or current custom routine if you have no prescribed ones.

A quick access to the Calendar will also be added to the Dashboard to replace the routines panel which will be moved to the bottom navigation bar to facilitate easier access to what will be a commonly used feature.

New icons will be investigated to improve clarity for the Inbox and to introduce the new Routines icon to the navigation bar. These will be chosen with the intention to match the system icons to real world representations to aid user understanding. [10]

Search Changes

Searching for Health Professionals and Movement Exercises will be separated out into two separate tabs to increase visibility of the ability to search for Health Professionals.

The Focus Area Tags will be made more apparent and their purpose will be more explicitly defined for a user through a renaming to Quick Search Tags along with the tags now being populated with search terms.

Additionally to ensure the affordance of the Limb Selector is obvious it will no longer be a separate search you have to click into and will instead appear directly on the search screen itself to increase the efficiency of use for the application.

Movement Name and Compare My Form Changes

The “+” icon used to add a movement to a routine will be moved to be next to the movement exercise name to increase the association between the icon and the entire movement screen as a whole.

The Compare My Form feature is proposed to have an additional display to show how you should perform the exercise in terms of orientation and will remove unnecessary intermediary screens to improve the design and increase the efficiency of use. Increased text size and the use of bolder colours to ensure it stands out will be used to convey instructions on these screens to the user.

Routines Changes

Clear labeling will be added to the routines bars to distinguish between prescribed routines and user created ones. The prescribed routines will now contain the Caduceus symbol along with the Health Professional's name and profile picture to differentiate them from user created routines. Using the Caduceus symbol often associated with Medicine along with the Health Professional

themselves will help aid in recognition over recall of which routines are user created and which are not.

A persistent “Create New Routine” button will also be present at the top of the screen to ensure users will be aware of the affordance to create new routines rather than being unsure of the functionality.

User Profile, Health Professional Profile and Inbox Changes

We agreed with user feedback that Inbox was more associated with emails rather than text based conversations which our prototype was intending to have this feature appear as. As such the Inbox feature has been renamed to Conversations and a new icon for the navigation bar has been found to make this clearer.

The User Profile and Health Professional profile meanwhile have been brought across with no substantial changes other than an increase in fidelity.

5.4 User Personas

Three personas were chosen to represent typical users of our application. Each represents a different set of requirements for the application, which we have tried to accommodate for. Please refer to Appendix D for the Persona screens.

5.4.1 Health Professional

Health professionals are those who have formally studied and practiced some sort of exercise science. These types of users will be providing information to their clients through the application, as well as communicating with them. They will be using a different version of the application, where instead of customizing their own set of routines, they will have a list of clients whose routines they can customise.

5.4.2 High-Activity Health Professional Client

This type of individual this persona represents is highly active, familiar with their bodies and wants to have access to stretching as they understand the value of it. They are likely to go to health professionals when they are injured, and want a way to monitor their routines. They are also interested in exploring more workout routines and ensuring they are maximising their potential exercise time with the correct form.

5.4.3 Low Activity Health Professional Client

This persona represents individuals that are less physically active, and need more help when working out. Some are uncomfortable going to a gym as they feel intimidated and unsure of what they should be doing. They cannot always afford a personal trainer, but still want to try and exercise in a safe and efficient way. The fact that they exercise less means that they are less prone to injury, and probably have less experience with exercise-injury related health professionals than the high activity users.

5.5 Evaluation

Due to Covid-19 our evaluations were done remotely over Zoom and Microsoft Teams while using Invision as the platform for interacting with the prototype. This approach caused many issues for us in usability testing due to connection issues and limitations from our lack of knowledge using Invision. This meant our prototype was far less dynamic than it could have been had the evaluations been conducted in person. We also lost out on the ability to view our participants and make inferences from how they acted while using the prototype as most participants preferred to keep their cameras off or had to due to bandwidth constraints.

Participant selection for these evaluations was, as with the interviews, limited to people within the teams social circle as we did not have the time to find participants in a wider range. This likely impacted the results as we were unable to get older participants or participants from different socio-economic backgrounds to participate in the evaluations.

For the most part the online systems worked perfectly during the evaluations and allowed us to conduct them with minimal technical difficulties. It was unexpected just how useful the inclusion of the 5 to 10 minute exploration time would be. It was a huge benefit to our evaluations as it allowed us to confirm that our design was highly exploratory and aided in task completion rates as even when things may not have been as obvious as we wanted for a user to find they often were remembered where certain features were thanks to the explorability.

In the future, we would like to conduct a similar evaluation with all the same steps but more refined tasks. We would also want to use a higher fidelity and preferable more interactive prototype than was used here. This would allow us to get a far better cognitive walkthrough of a user’s actions as there will be far less items that are unclear due to fidelity which we would need to attempt to explain.

6. APPLICATION DESIGN

This section describes a task-orientated design of the final application design, transition diagrams for each task are assumed to start from the Dashboard or from the Bottom Navigation Bar unless specified. See Appendix F. This section will also discuss the rationale behind the design decisions.

6.1 Foundational Interface Elements & Design Rationale

6.1.1. Affordances

Affordances have been granted by the following UI Components over the prototype in its entirety:

Interactive Cards, Buttons and Tags

Buttons and Tags provide interactivity within the app. Buttons have been defined as rectangular elements with text that is bordered to indicate the virtual depth to the likes of a physical button. Colours are an indicating factor against the white space of the app. Interactive cards also offer a similar affordance when navigating between pages throughout the app.

Text Query Input Areas

Text Input Fields are predefined bordered spaces where users can enter textual information. Text inputs are aided by Placeholder Hints. As the search field, the search icon text input field is indicated by the universal standard magnifying glass with a Placeholder Hint. These fields are limited as it is a cause for user input error.

Overlaid Controls

Negative affordances have been embedded to allow for minimal screen transitions and convenience. This aids the users’ understanding of certain being inactive for a period of a task they are performing; thus, places focus on the task on hand. As in the User Profile Page when training types are being edited the “Training Types” is put into focus by overlaying current context controls over the profile screen’s standard controls

As the KineoGuard Platform is of complex nature, a main design focus was to consider simplicity in navigation. The following component is an important factor in achieving this.

6.1.2 Design Principles

The application was designed in accordance with Jakob Nielsen's Design Heuristics [10] and Tufte's Signal-To-Noise Ratio [12]. The following principles were applied throughout the prototype:

Correlation between Reality & System [10]

Understandable and casual language is used and preferred over strict jargon when deciding on written content that is present in movement instructions or textual search results. This allows users to comprehend content without needing to research any terms that they would not have hypothetically understood[10]. KineoGuard focuses on clear navigation with main pages being headed with the name of the current page, each of the 5 most important tasks is also mapped to 5 distinctive icons in the Bottom Navigation Bar. The main dashboard page is represented by the "home" icon for example, which matches the mapping of habitation to the page that users will start upon opening the app.

Recognition Over Recall [10]

In terms of Recognition over Recall, in conjunction with Consistency, Aestheticism and Minimal Design mentioned above, components are designed from already common design languages. This lessens users learning curves through elements being already familiar as of experience with other mobile applications making use of material design standards [10]. Such examples of this in KineoGuard include the use of "Cards" as discussed in affordances, as well as the layouts of the Conversation and Dashboard Screens which mimic the layouts of popular applications.

Consistency, Aestheticism and Minimal Design [10]

Users only experience the features that they require on any given screen. Any other accessory features have been condensed into single buttons or only activated through means which also make use of negative affordance, such an example can be seen with the aforementioned training types editor. Similarly in the Routine Editor, Movement editing tools are behind the tap of the edit function button, rather than being displayed without such a feature. This allows the user to conveniently input their textual query without suffering information overload or a level of overwhelming complexity.

Mobile design guidelines such as Material Design were followed to maintain consistency between all the prototype's screens as well as offer a familiar experience to the user for both IOS and Android users, where expansion to a desktop application becomes easily transcribable. This removes doubt in users' thought flows as actions and context.

Visibility & Feedback[10]

Robust response is offered for when user interaction occurs. Features such as navigation are represented by the Bottom Navigation Bar which indicates where the user currently is by highlighting the current option and hollowing out the area. During Routine editing, immediate pop-up dialogs are presented when a user attempts to delete a routine as another example. This method of providing feedback ensures that users are aware of critical actions that could be detrimental to their wants if not double-checked. This reduces the cause for frustration and confusion.

Error Prevention and Constraints [10]

Design constraints have been implemented to ensure that user input where interactivity is required is formatted correctly and allows for a fluid experience. An example of this error prevention technique is shown in Routine Reminders. Rather than requiring users to input text-based time values, users must instead select time-based on time value scroller components, and repeating days are selected by tapping a Circular Day Selector Button for the week. This ensures accuracy and correct format of their input.

Help & Documentation[10]

Documentation where user interaction that warrants user input is displayed with grey hints "Placeholder Hints" to explain in clarity what a particular component does. This allows users to complete tasks and achieve clarity when performing ambiguous actions. Hints have been used this way as it is unobtrusive.

User Control, Freedom & Shortcuts [10]

Users have an unrestricted flow of navigation with constraints embedded to prevent premature departure from certain tasks. Every page without a Bottom Navigation Bar has an embedded "go-back" arrow which allows users to leave a page if they have mistakenly entered or left a disjunctive page. The implementation of a Bottom Navigation Bar allows a user to switch between screens immediately without the need to shift between multiple screens to reach their starting position or another.

Implemented shortcuts are naturally minimal as the design itself requires little traversing through pages or elements to achieve completion of a task. Shortcuts do appear in the form of "tags" on KineoGuard, or "chips" when thought of in Material Design. Each "tag" represents qualitative data stored about a particular user but also represents a point-of-entry for viewing related content on KineoGuard for tag-name related movements or professionals. In Search, Knowledgeable users can search directly for a muscle group with a Textual Query, or a Movement with the correct movement name.

Signal to Noise Ratio [12]

Throughout the prototype, minimal elements have been displayed on the screens allowing for enough white-space to allow the user to perceive that the screens are of low density and understandable. This allows the user to maintain a high level of interest and lessen the cause for frustration.

6.1.3 Bottom Navigation Bar



Figure 6.1.3: The Bottom Navigation Bar will appear throughout all screens unless there is a requirement for additional space where it will then be omitted from the screen to provide for a low-level of cognitive load. or as displayed above in Figure 6.1.1. On the Bottom Navigation Bar are navigational links to the "Search", "Conversations", "Home" "Routines", "Profile" Screens. The selected page's icon will have a highlighted "blue"

coloured icon and hollowing outline around the icon on the bar. In this instance, the selected page is the “Home” Page.

6.2 Features

6.2.1 Dashboard - Appendix E-1

KineoGuard Dashboard

This displays the dashboard which acts as the “Home” page which will be seen when a user opens the KineoGuard Application. On the Home Page, the user has access to Cards which serve as interactive navigational links to various sections of the app:

1. “SUGGESTED FOR YOU”

- a. This displays a horizontal-scrollable list of Cards which display recommended movements for a user based on their training type and style.

2. Prescribed Routine

- a. This displays a Card to a routine that their “preferred health professional” has prescribed.

3. Scheduled Routines

- a. This displays a Card to the user’s current routines that need to be completed for the day.

Additionally, the “Search” is available in the form of a “magnifying glass” icon to the right of the Dashboard heading which serves as a navigational link to the “Search” Page.

6.2.2 Searching - Appendix E-2

Movement & Health Professional Search

This process starts with the search screen which allows users to search KineoGuard for both muscle groups and movements and Health Professionals. Users can switch to the “Health Professional Search” **Appendix E-2:** by selecting the Multifunctional Link at the top right corner. The filters and quick search options are:

“Movement Search”

1. The “Muscle Group Quick Search” makes use of Tags to search and display results pertaining to a muscle group.
2. The “Muscle Selection” feature allows users to search by selecting a muscle group shown on a 3D rendering of a human body. This rendering can be rotated to view the Posterior, Anterior and Lateral views of the human body for better muscle selection. This is specifically envisioned for use when a user may simply feel pain but not know what the exact muscle is called to search for.

“Health Professional Search”

1. The “Specialization Quick Search” makes use of Tags to search and display results pertaining to the platform’s Health Professionals’ varying specializations.

Both Search page variations have Textual Input areas, which are given placeholder hints to aid the user in entering a search query. Whilst placeholder hints provide items that can be searched, it only displays the more obvious search term types. For example, a muscle group is hinted as a search query Movement Search , but movement names can also be searched. This is due to the Tags

which hold information about movements and other relevant details pertaining to a search item. An example of this can be seen in the “Mobility” Search results page.

Textual Input and Tag Results

This displays results from entering a textual query or tapping a Tag. The top displays text that will resize depending on the length of the query to fit the screen for readability. The “peach” text shows the user’s query. Below this text, is a list of Cards. These Cards represent a movement which a user can click on to go to a movement information page.

Muscle Selection Results

This displays the list of movement information Cards in the same fashion as the Textual Query and Tag result page. At the top of this page displays the user’s selected muscle on the 3D rendering of the human body model and displays the name of the muscle selected to inform the user of what their choice is.

Health Professional Search Results

This displays results from entering a textual query or tapping a Tag. The top displays text that will resize depending on the length of the query to fit the screen for readability. The “peach” text shows the user’s query. Below this text, is a list of Cards. These Cards represent a “Health Professional” which a user can click on to go to their respective profile pages. The cards also display the Health Professional’s specializing areas in the form as tags, as well as their title above it.

6.2.3 Movement Information - Appendix E-3

Movement Information

This displays information pertaining to a movement which provides the user details regarding its usage. On this page are the following sections:

1. The name of the movement as at the top of the screen.
2. A “+” button allows the user to add this Movement to a New or Existing Routine which will be elaborated in the sections to follow.
3. A video tutorial from an accredited source approved by the Health Professionals to show the user how to perform the movement.
4. Focus Areas related to this movement which uses Tags to describe the areas worked or its training type.
5. A Form Comparison feature which will be elaborated in the section to follow.
6. Instructions to account for those users who are hard of hearing or unable to make use of a video. These instructions display images for each stage of the movement and text to describe how to perform the movement.

Adding Movement to Routine

This displays a dialog once the “+” button is tapped. It displays a list of current routines that exist and has been created by either the user or their health professional. Users can select multiple routines, by tapping on the radio buttons on each item of the list. Below the main dialog is the “Sets and Reps” dialog where users can input the number of sets and reps that they would like to perform this movement for, when being added to the routine. A Multifunctional Link also appears at the top of the main dialog

allowing users to create a new routine, which falls under the “Routine Management” Task section to follow. Once the user taps add, feedback will be shown on the initial page. *See Appendix G.*

6.2.4 Form Comparison -Appendix E-4

Form Recording

This displays the Recording Screen for the Compare Form functionality. This functionality allows a user to record themselves performing a Movement and have it played simultaneously alongside the video tutorial to allow a user to compare their form to that of the professional in the video. A user’s device’s camera feed will display on screen, the user will then need to record themselves performing the movement. The user has a Placeholder Hint above the recording button instructing them on how to use the recording button below it. This has been designed to mimic the standard design throughout smartphone’s camera features.

Form Comparison

Once the user completes the recording, their video will be processed and displayed on the left-hand side of this screen. The right-hand side displays the correct form as shown by a health professional or personal trainer. In the centre of the screen are the following buttons and Placeholder Hints:

1. “Change Correct Form Angle” supported by “To change the point-of-view of the correct form”.
 - a. If a user wants to see another view of the form (behind, side etc.) then this feature will change to a video that matches their desired viewpoint.
2. “Synchronise” supported by “To match the speed of playback between your form and the correct form”.
 - a. If the user’s video is too slow or fast, or if the professional’s video is too fast or slow, this feature will allow the user to correct the speed difference so that they can better draw a comparison between their form and the correct version.
3. “Send to Dr. Joe Bloggs” supported by “ Send your form to your professional”.
 - a. This button will allow the user to send the video to their set preferred health professional directly in-chat. The button will reflect the name of their preferred health professional, in this instance it is Joe Bloggs.

6.2.5 Health Professional Interaction - Appendix E-5

Health Professional Profile

This shows the Health Professional’s profile which will be visible to the user. The profile contains general information regarding the Health Professional such as their name, a profile picture, the location of the practise, their qualifications, areas they specialise in treating using Tags. These metrics are immediately available to the user to assist in making an informed decision on who may be the best Health Professional to make an appointment with. Additionally, the Health Professional can add a cell phone number to allow a user to call them directly to make an appointment or else there is the option to directly message the Health Professional within KineoGuard.

Below the Health Professional’s name and qualifications is a “Make My Preferred Professional” button. Users can use this

feature to set this professional as their preferred professional whereby their prescribed routines will appear on the user’s dashboard. If this profile reflects a professional who is already a preferred professional, then the button will reflect “Remove as Preferred Professional”.

Conversations List

This displays the Conversations list which displays the varying chats a user may have had with health professionals on the platform. Cards represent each chat, which shows a Professional’s Full Name with their Title, and the chat’s last message with a timestamp and date on the right-hand side of the card.

6.2.6 Routine Management - Appendix E-6

All Your Routines

This displays the “All Your Routines” page which will be used to track all routines that a user has made as well as a prescribed routine from a health professional. This allows a user to easily find routines they may have created as a once off on the schedule and use them again. Each routine on this screen is denoted by a Card. Where user created routines are editable as denoted by the edit button on the card which takes a user to the routine editor once tapped. Prescribed routines have the Health Professional’s Profile Photo on the Card. Multifunctional Links (“See all”) appear near the section headings, to expand or contract sections if they are longer than the screen height.

Scheduled Routines View with Drop Down Date Picker Selected

This displays a list of routines, through Cards, with the calendar drop-down displayed. The calendar allows the user to go through any date to see which scheduled routines are occurring on which days. The drop-down is activated by the circular arrow icon next to the “Today” text which will reflect the date in “DD Month YYYY” form once the day has been changed.

Routine Editor

This displays the in-routine view with editable controls, allowing the routine name to be changed as denoted by the blue pencil icon. Movements can also be added through the Textual Input Search feature which will direct the user to the “Search” feature of the application, where the “+” button will add to the current edited routine. Routines can also be deleted by clicking the bin icon next to the movement, and movements can be shuffled by holding down the drag icon and moving the movement to the desired position. An option for selecting a notification has been added, if user do not want to have a reminder time, they can use the bell icon to deselect the reminder time feature. Selecting this will grey out and cross out the bell and time selector. However, clicking on the time selector opens a dialog with a spinner to select time. Underneath is the day selector option which allows users to select the days for which they want the routine to repeat, an example of this selection can be viewed in the Routine Editor. Once a user selects save on the routine editor, the user will be shown a confirmation dialog for their changes.

6.2.7 Profile Training Types & Help Appendix E-7

Profile & Training Types

This displays the user profile screen. This screen allows the user to edit Personal Details relating to fitness interests, past injuries, height, weight, and other general information that may be useful to a Health Professional accessing their profile, edit Security Settings, Billing & Subscriptions, and access KineoGuard's Support features. There is also support to change and a display picture and link one or more Health Professional to the user's account.

Training Type Tags also exist which control which movements appear in the "Suggested For You" Card list. at the top of the Dashboard screen. The Training Tags adding process also includes auto filled tags which appear as the user types at which point, they can then select to add to the list. After selecting a tag, it disappears from the options available to select.

Help & Support

This displays the Help & Support page. This allows the user to run through the application's initial start-up tutorial, contact us, access frequently asked questions to help with any usability problems they may encounter and view the Terms of Service & Privacy Policy for KineoGuard.

7. CONCLUSIONS AND FUTURE WORK

This report presented the design cycle of the KineoGuard app, an application meant to provide a platform to connect clients to health professionals and more easily facilitate the rehabilitation process along with providing a repository of exercises for active individuals to make use of in a personal capacity. The design process began with a series of interviews, followed by an initial prototype design phase, a series of usability tests and finally a second iteration of the prototype design. The interviews highlighted the desire for an application to track stretch routines and the lack of trust in AI pivoted the focus to improving the rehabilitation process for health professionals and their clients. The KineoGuard app allows users to connect with health professionals, easily receive and view their rehabilitation programs and allows users to create their own custom stretch routines for after exercising. The prototype was evaluated using a cognitive walkthrough usability test where the user was allowed to use the prototype and dictate their thoughts and actions as they did so while also completing set tasks. The evaluations provided much qualitative feedback which was then used to inform the design of the next iteration. The current application has only received comment from two health professionals so in the future we would like to get more health professionals onboard to further refine the features for their use. Additionally we would also like to run another usability test with the next iteration of the prototype to ensure that all the design decisions made have succeeded in meeting the needs of the users.

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APPENDIX

A: Interview Questions

General questions below, however during the interview there were follow up questions based on the participants answers

Age, Height and Weight:

Fitness Level (Low, Medium, High):

Fitness Goals (Select One): Hypertrophy / Cardiovascular Health; Endurance / Weight

Loss / Powerbuilding / Improving Sport Performance / Other

If “Other” for the above , please state:

Gym Membership:

What is your daily routine?

How knowledgeable are you about your body and its muscles and their relationship to exercise?

Do you typically have your phone with you during exercising?

Where do you normally do your exercise?

When do you normally exercise? Time of day and why?

How often do you engage in physical exercise?

Do you have a workout plan/structure? If so elaborate.

Have you ever gotten any type of injury from working out? Please describe the injury(ies).

Were you worried about what was wrong if you could not identify the cause and why?

How did you handle the respective injuries, in terms of continuing to exercise, doctor visits and treatment?

Have you ever avoided seeking professional help despite having a possible serious injury in order to save money?

Have you ever avoided seeking professional help when having an injury for other reasons? If so, what were the reasons?

Would being able to get possible knowledge of what caused your injury and self-remedies to try at home be appealing to you and why or why not?

Would you prefer to access this information online, via a mobile app, or face-to-face with a professional. Why?

What are some of the frustrations or bad experiences you deal/have dealt with when seeking out this information, if any?

What is your sentiment towards Artificial Intelligence?

Rank your level of trust in Artificial Intelligence on a scale of 1-10, with 1 being the least trusting and 10 being the most trusting?

Are you comfortable with receiving medical information from Artificial Intelligence over, or in conjunction with a human medical professional?

To ensure you don't get injuries, would easy access to 'massages' (and stretches, movement exercises) you can do to your own muscles be of interest to you? And why?

Would you trust advice given to you by an app in regards to your workouts? And why?

B: Tasks required for Prototype Evaluation

- General Navigation to various screens chosen at random
- Find and view a muscle exercise
- Create a stretch routine
- Edit an existing stretch routine
- Find and contact a physio
- Record an attempt at an exercise and compare your form
- Go to the calendar with the intent to change to a different date
- View a Scheduled routine from a physio

C: Post Prototype Evaluation Questions

Their overall experience with the app

How easy they found the app to use

Which features or functionality were difficult to use (and why)

Thoughts on "compare form" feature.

What they would change about the "scheduling" feature.

Thoughts on search functionality.

General feedback they would like to give

D: Personas

Megan Locke
32, Cape Town
Physiotherapist

PERSONALITY

- Highly Introverted
- Scientifically Minded
- People-person
- Physically Active
- Perfectionist
- Health Conscious
- Conscientious

BIO

Megan is a physiotherapist who owns her own private practice, employing several other physiotherapists. She works hard to deliver top-quality service to her customers. She loves her job because she can set her own working hours and work from home. When she gets home, she works out, usually on her standing bicycle, while catching up on her favorite TV shows. Megan knew she wanted to study to become a physiotherapist as soon as she left high school. To her it was the perfect job because she has always been passionate about exercising, and being quite scientifically minded, she wanted to have an in-depth understanding of the human body in relation to exercise.

Motivations

- CAREER GROWTH
- TEAMWORK
- PERSONAL HEALTH
- REVIEWS

Goals

- Stay fit to be physically healthy even as she enters old age.
- To grow professionally, better her business, attract more clients.
- Improving her physiotherapy techniques
- Finding new innovative ways to improve the rehabilitation experience for her clients

Frustrations

- Getting the technology part of her business right - configuring her CRM system, getting the printers to work, getting Excel documents to do what she needs them to do
- Encouraging clients to keep doing the rehabilitation exercises daily
- Worrying whether clients are doing the exercises correctly once at home

Technology

- Cell phone
- Laptop
- Technology - apps, email etc. are essential, but very frustrating when she can't get them to work correctly.

Scenarios

- Megan wants to easily provide a client with a rehabilitation routine which shows them how to perform the exercises in clear, easy-to-understand printed off pieces of paper.
- Megan wants to change a clients rehabilitation routine to swap out one stretch for another without needing to send an email with possibly confusing instructions.

Frequently used apps

YouTube Netflix Instagram

Figure D.1: Health Professional Persona

Bruce Jacobs
23, Cape Town
Real Estate Agent

PERSONALITY

- Laid back
- Extrovert
- Loud
- Physically Active
- Health nut
- Kind
- Helpful
- A "Gym bro"

BIO

Bruce is a happy go lucky real estate agent for Home Ltd who believes that no matter what happens you should always have fun in life. If he's not at the office chatting with his colleagues, showing potential buyers around houses or out for a drink with his mates then he's probably in the gym doing weight training. On the weekends he loves to do adventurous activities such as rock climbing or go on social adventures such as hikes.

Motivations

- GETTING STRONGER
- IMPRESSING WOMEN
- PERSONAL HEALTH
- COMPONENTS

Goals

- Get down to 10% body fat
- Bench press 140kg
- Run 5km in under 30min
- Improve weights for all exercises over time
- Complete his rehabilitation routine so that he continues doing leg workouts again

Frustrations

- Finding new exercises to try in the gym when old ones feel ineffective
- Mild continuous pain from aggravating prior injuries whenever he exercises too heavily
- Remembering to do his rehabilitation exercises from his physio for his knee injury

Technology

- Cell phone
- Laptop
- YouTube
- myfitnesspal
- tripadvisor

Scenarios

- Bruce wants to find stretches to relieve his muscles after a heavy lifting session.
- Bruce wants an easy way to remember what stretches he must do for his rehabilitation and wants to be reminded to do them.

Jeff Smith
19, Cape Town
Computer Science Student

PERSONALITY

- Quiet
- Shy
- Weird and open around people he's comfortable with
- Nerdy
- Compassionate
- Passionate

BIO

Jeff is a good student who wants to try his best but is prone to procrastination. He never misses an assignment but usually gets them in just on time, when not too far away for lectures or assignments during the week he'll normally be in his dorm room playing videogames, reading or doing University work. Over the weekends he likes to spend time with friends and relax instead of doing high activity social events. He also has a slightly unhealthy addiction to Uber Eats due to not enjoying dorm food that much.

He tries to work out at least three times a week to not be completely unfit, but motivation is a struggle. He wants to be in shape but struggles to get to the gym as often as he should and often after going, he feels too sore to do much the next few days.

He is currently studying a BSc in Computer Science at UCT.

Motivations

- LOSING WEIGHT
- FEELING MORE CONFIDENT
- GETTING HEALTHIER
- LOOKING BETTER FOR HIS PARTNER

Goals

- Lose 10kg over the next 2 years
- Go to gym three times a week regularly
- Cycle 5km on an exercise bike without stopping
- Improve recovery time after gym sessions

Frustrations

- Sore muscles after gym sessions
- Feeling too awkward to ask for help with form in the gym
- Being unable to afford a personal trainer to help with gym

Technology

- Good data plan
- University wifi
- Used for music during workouts
- Laptop
- Playstation 5
- Very keen on AI but aware of current limitations, thus interested to see its first uses in the medical field but wouldn't fully trust it.

Scenarios

- Jeff wants to learn how to improve his form for gym exercises so that he doesn't feel as sore and potentially hurt himself.
- Jeff wants reduce the stiffness and soreness of his muscles with easy stretching exercises or massages he can do in limited space in a dorm room.

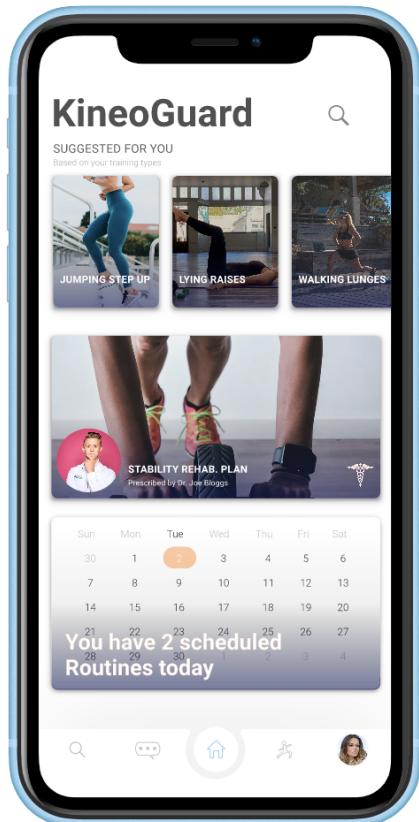
Frequently used apps

YouTube Uber Eats Kindle

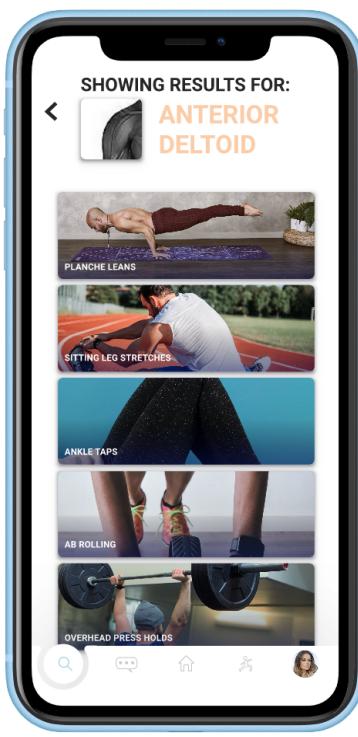
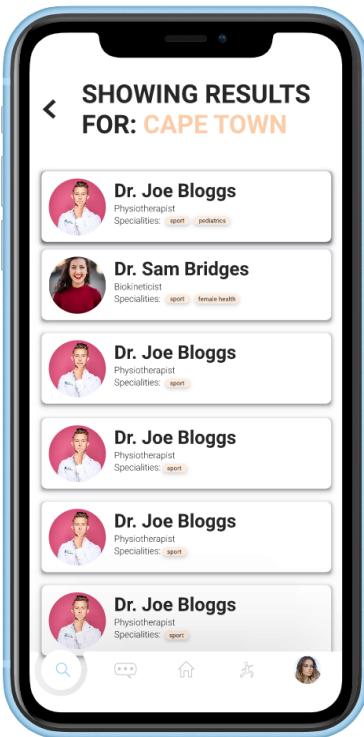
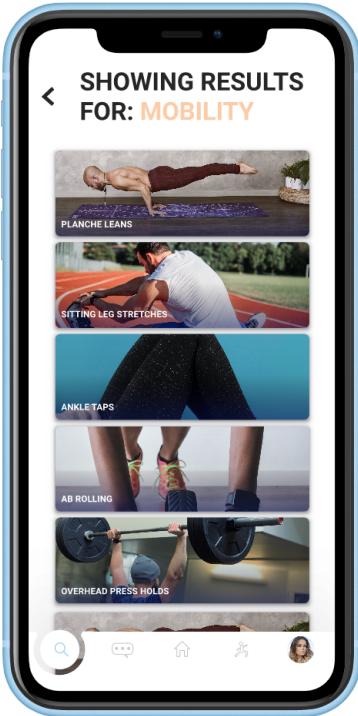
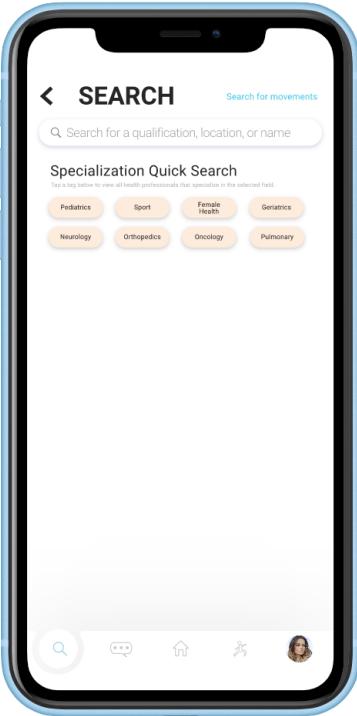
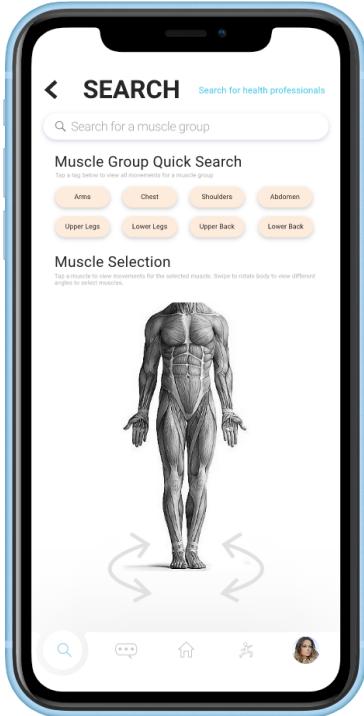
Figure D.3: Low Activity Persona

E: Final Application Screens

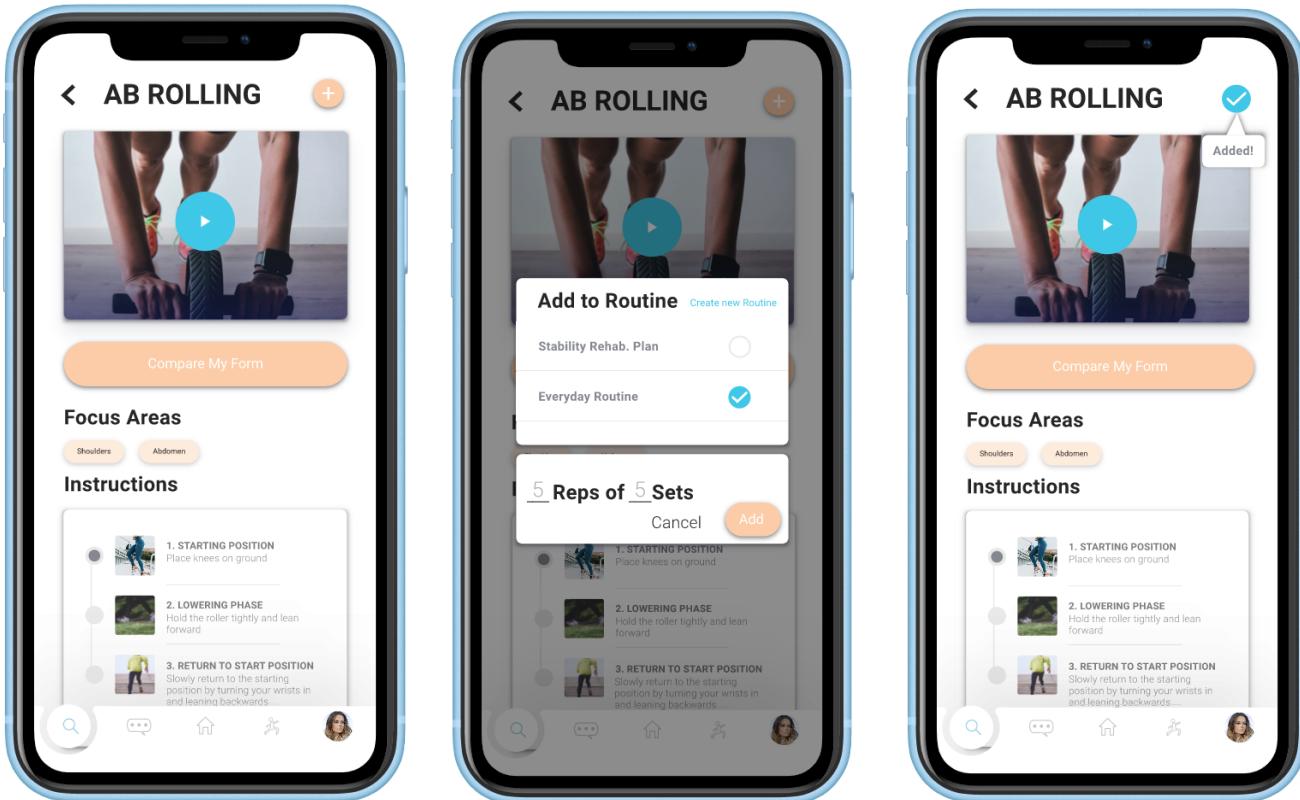
E-1: Dashboard



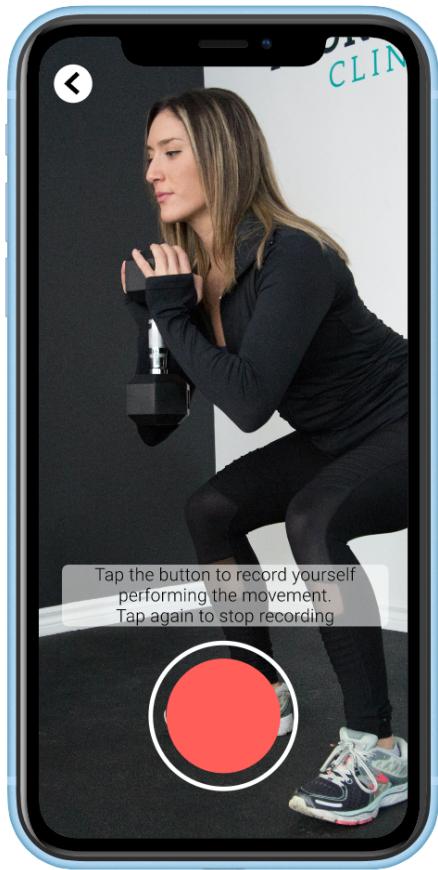
E-2: Searching



E-3: Movement Information



E-4: Form Comparison



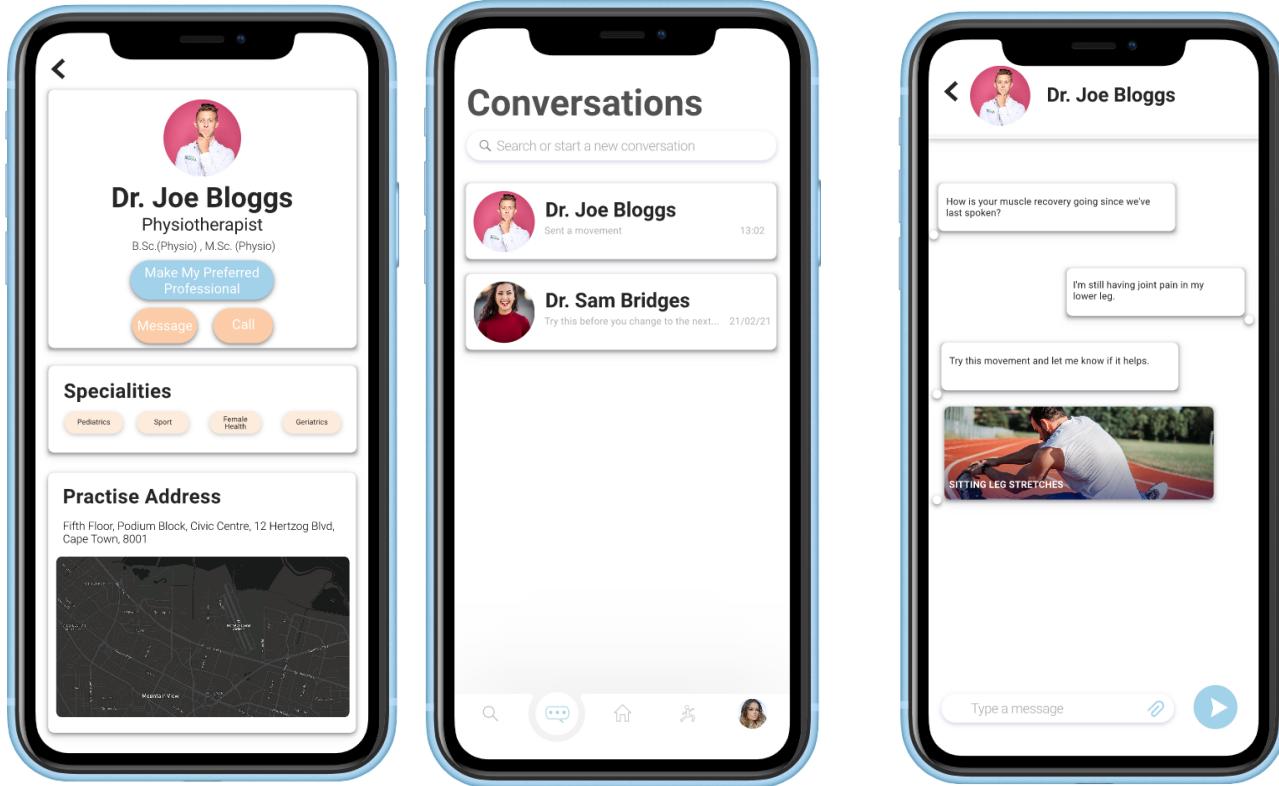
The smartphone screen displays a comparison interface between "Your Form" and "Correct Form".

Your Form: Shows a video of a woman performing a squat with a dumbbell. To the right, there are three buttons: "Change Correct Form Angle", "Synchronise", and "Send to Dr. Joe Bloggs".

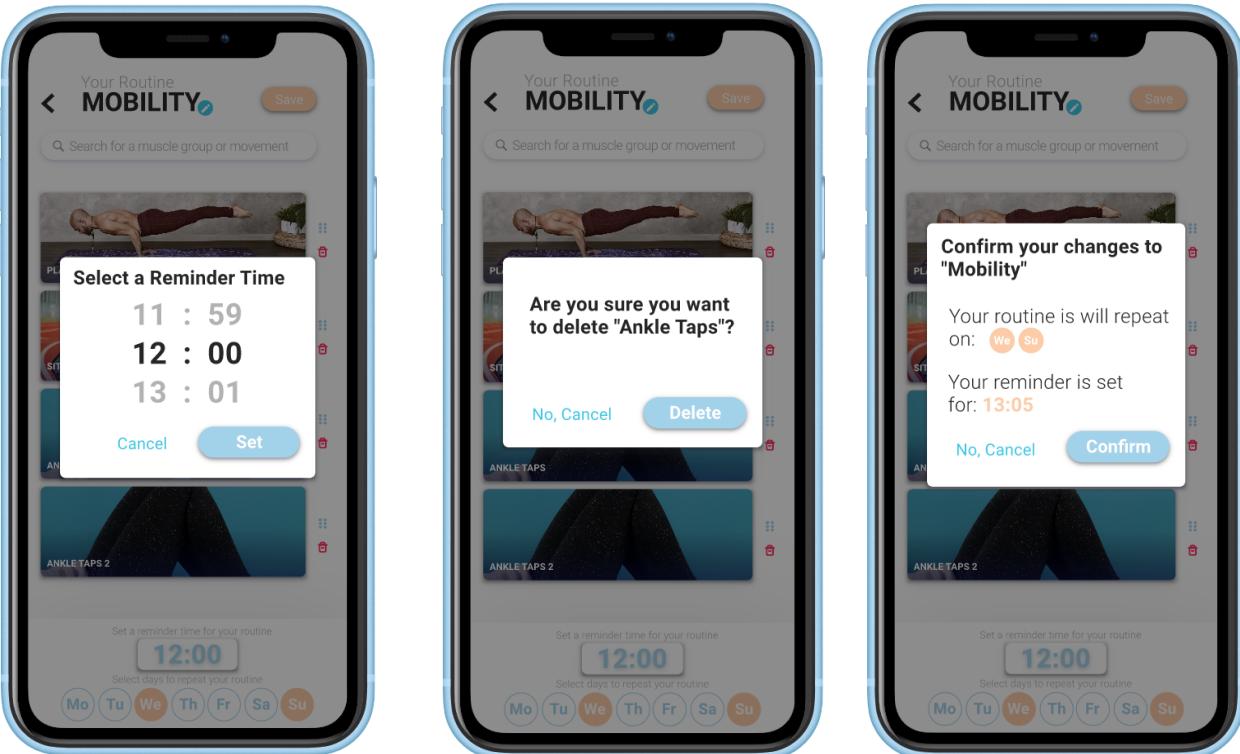
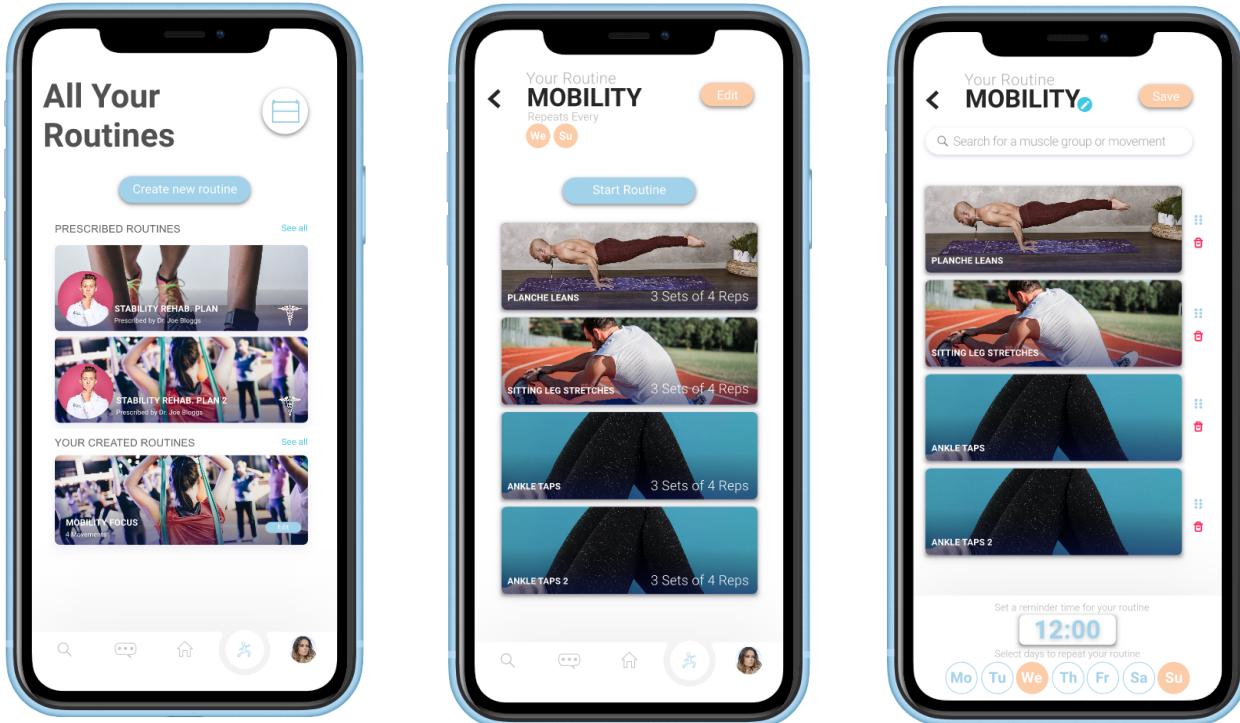
Correct Form: Shows a video of a woman performing a squat with a dumbbell.

Text overlays provide instructions: "To change the point-of-view of the correct form.", "To match the speed of playback between your form and the correct form.", and "Send your form to your professional."

E-5: Health Professional Interaction

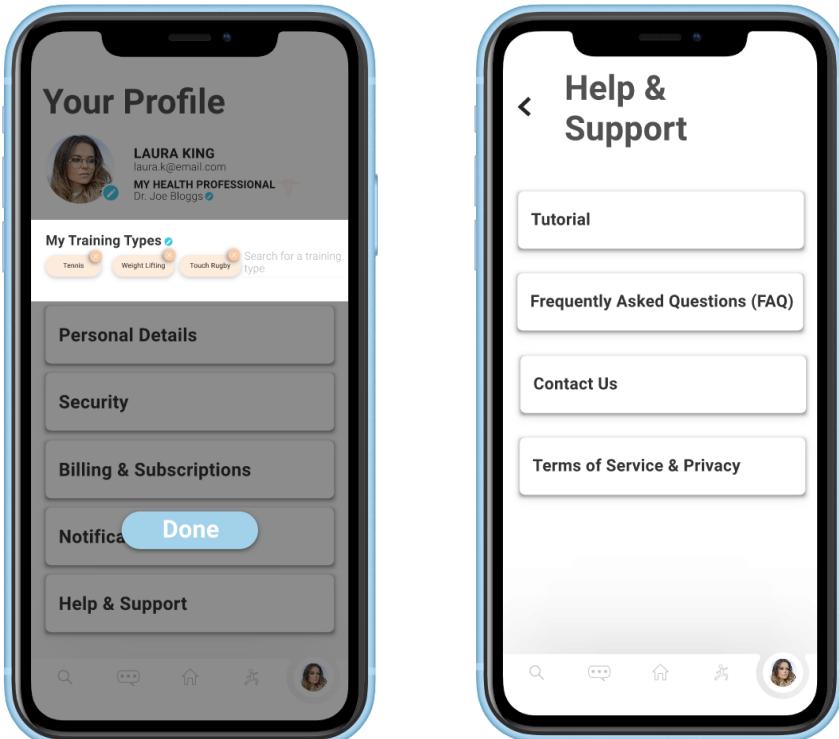
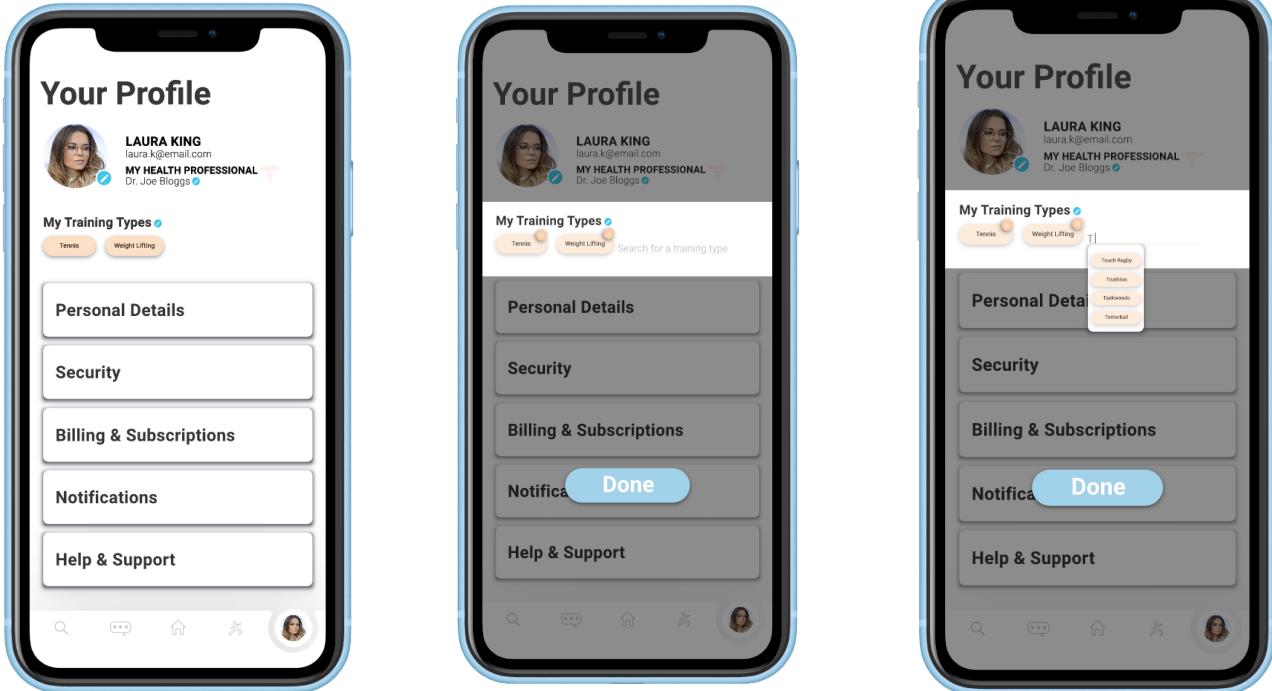


E-6: Routine Management



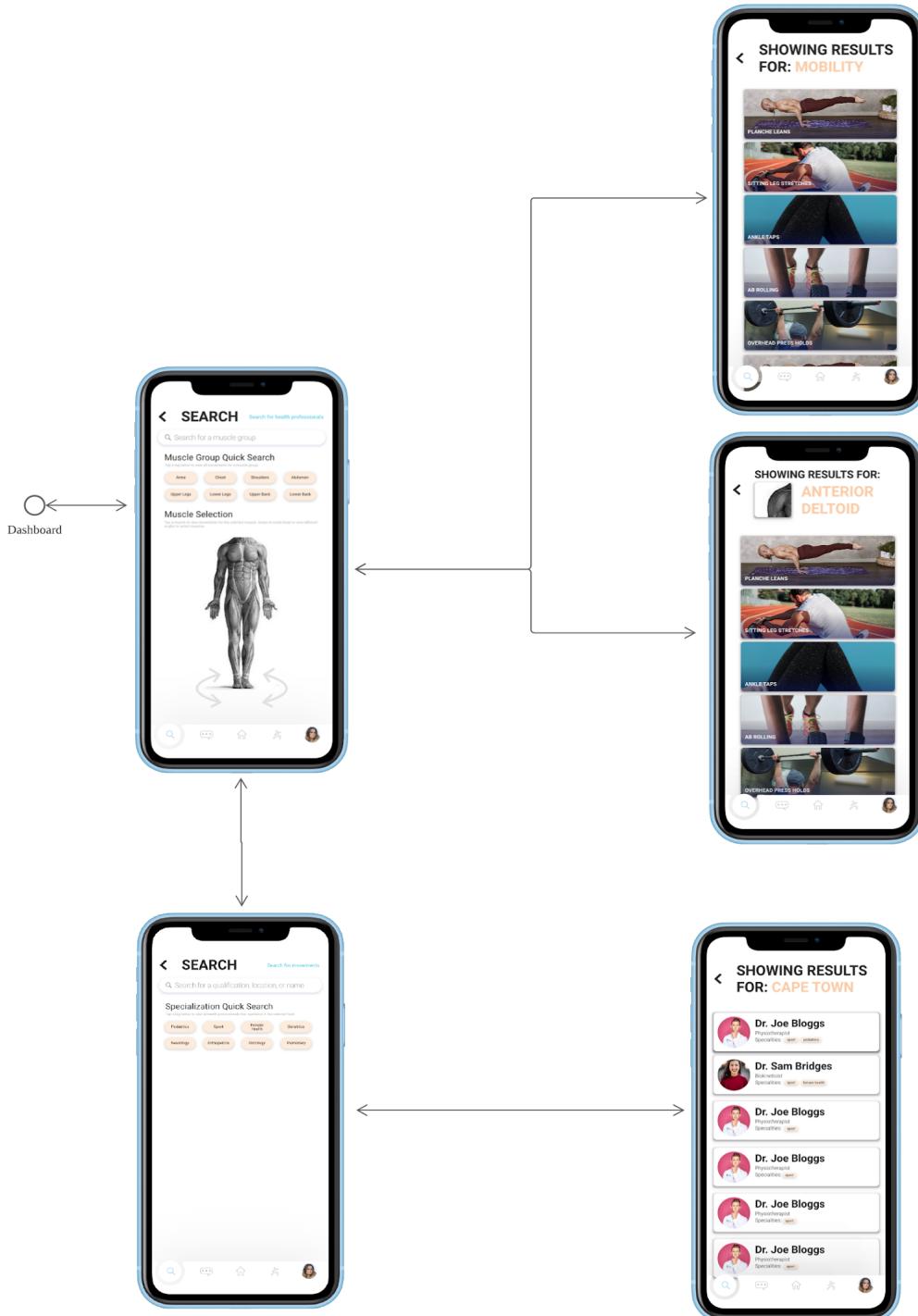


E-7: Profile Training Types and Help

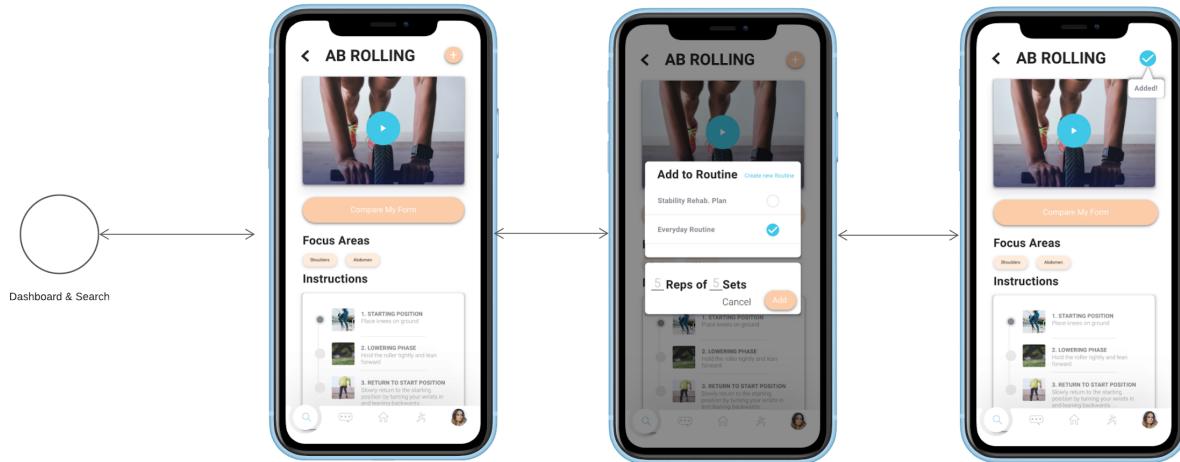


F: Final Application Transitions

F-1: Searching



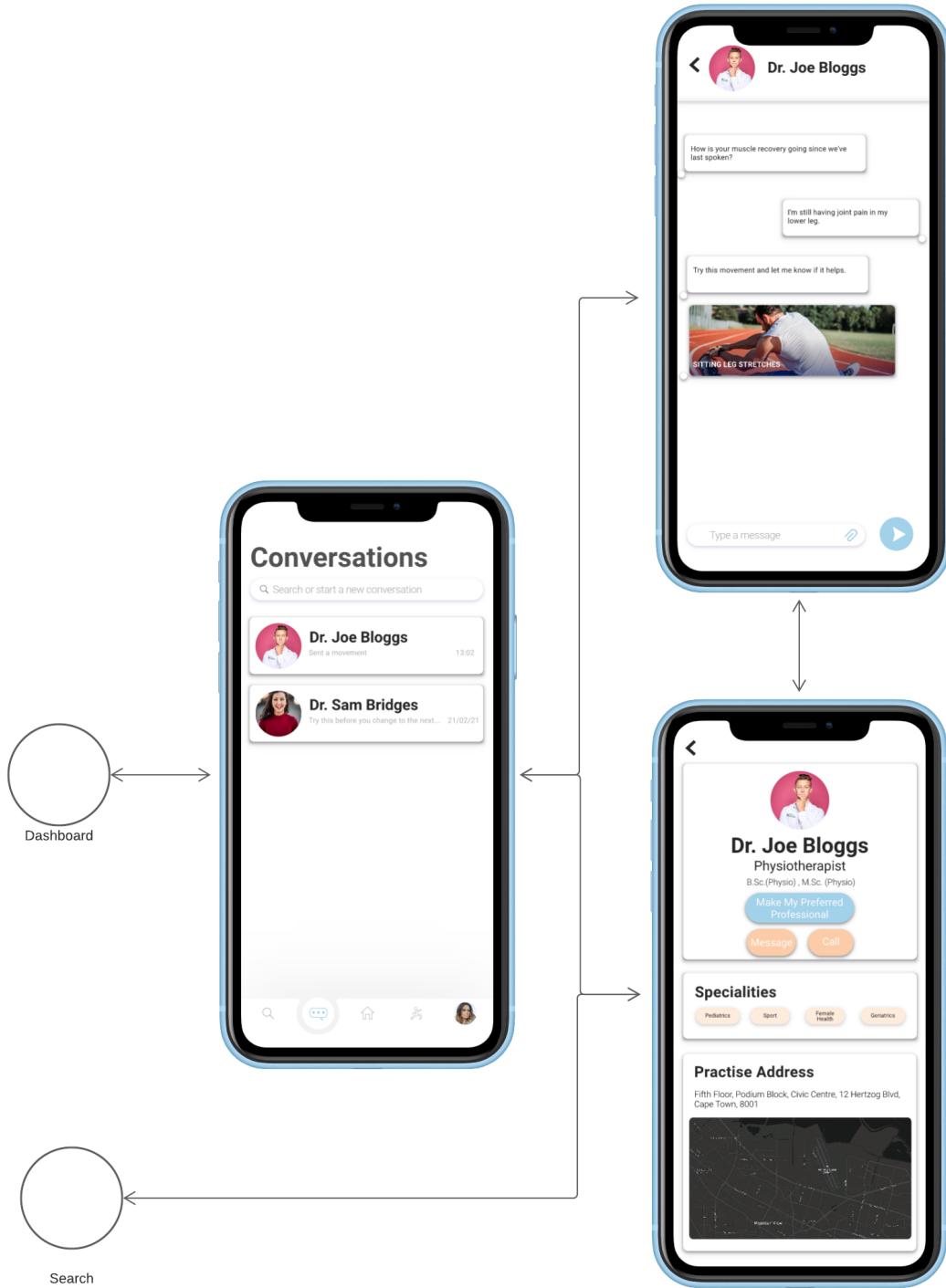
F-2: Movement Information



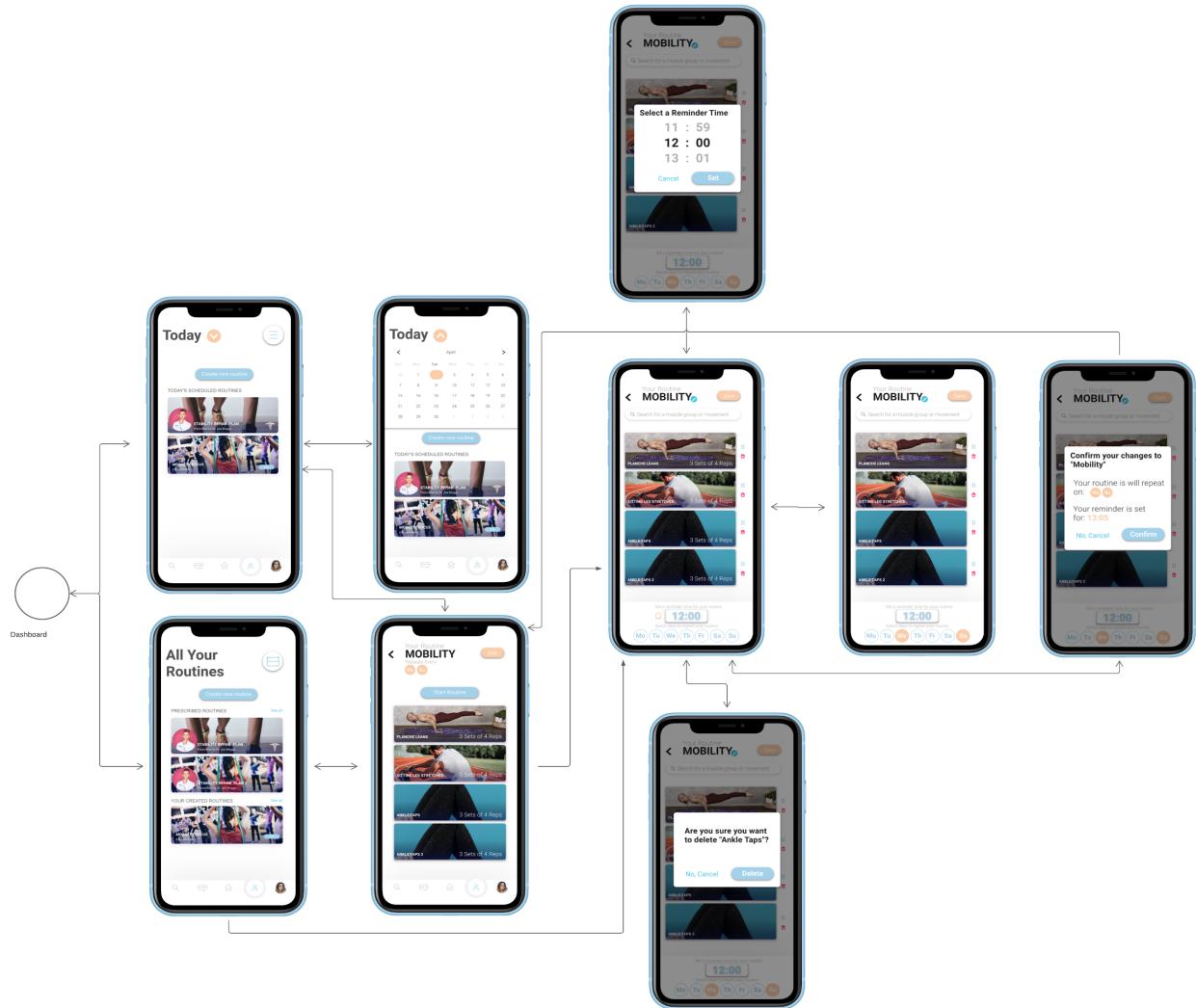
F-3: Form Comparison



F-4: Health Professional Interaction



F-5: Routine Management



F-6: Profile Training Types & Help

