The use of digital technology for rehabilitating clinical populations across the lifespan.

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Introduction

- The COVID-19 pandemic has highlighted the need and benefit of digital health intervention (DHI) in promoting better health-related quality of life (HRQoL) outcomes in children with clinical conditions [1].
- While it is acknowledged that DHI's are beneficial there is evidence of low adherence levels to the full intervention [2].
- In order to promote better DHI adherence, it required that motivational affordance (MA) are integrated into the DHI [3], increasing adherence and therefore HRQoL outcomes.
- MA's are attributes of interactive technologies or game elements that promote participation in physical activity routines [4].
- It is necessary to acknowledge that MA's vary throughout the lifespan [5]. It is therefore important to acknowledge these differences when designing DHI's.

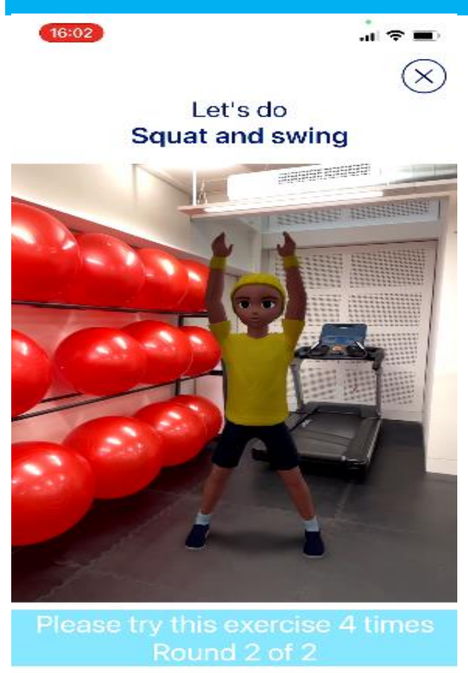
Aim

Provide examples of different implementations of MA's within different clinical groups for the purpose of increasing adherence to DHI for clinical conditions.

Gamification

Gamification is seen as a way of increasing adherence to DHI's. It is defined at "the use of game design elements in non-game contexts" [6]. This can vary from competition-based incentives to character avatars and immersive environments. It aims to improve the interaction between users and the application in question, for a purpose other than pure entertainment while using the motivational principles that games provide [7].

Augmented Reality (AR)



Smartphone technology among participants aged 9-18 (*n*=47) demonstrated that in order to maintain adherence the avatar needs to be customisable as well as deliver the correct exercises

"[...] So you can design your own avatar so that you can change their hairstyle and add different clothes [...], make them wear a hat and change their eye colour [...]" (Y7)

"The visual representation is really helpful so at least you know you are doing the exercises right" (Y12)

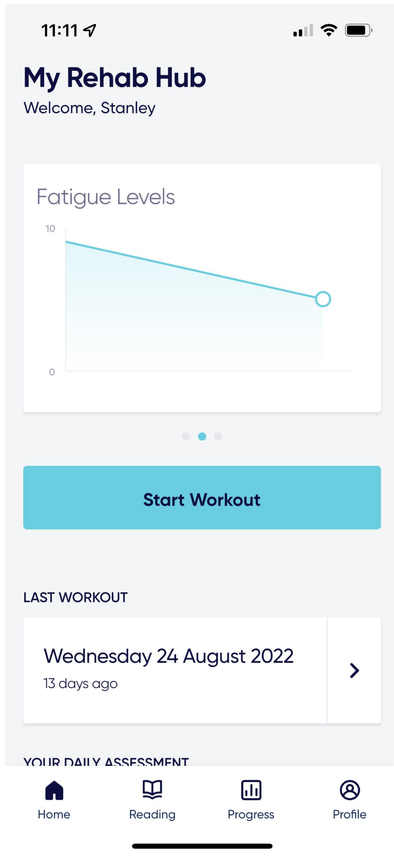
The use of Google HoloLense technology on adult cancer survivors (*n*=20) demonstrated that the technology must fit the application purpose and that AR avatars are seen as more like human companions with less need for customisation.

"I will miss working out with Jill, I was becoming rather attached, my exercise friend, she made it enjoyable to do the rehab" (P020)

"The idea of the technology is good, but exercising with all that weight on your head was hard, and not very practical at times." (p.004

Progress tracking

When deploying DHI's the ability to digitally record interaction is critical and our studies have all confirmed that progress tracking encourages positive reinforcement to the DHI from clinical populations.



In populations with chronic respiratory disease (*n*=70) the implementation of a progress tracking screen acted as extrinsic motivation for participants.

"when you log in and see your stats it almost makes you feel guilty, this kept the fact that I needed to do the exercises right a the front of my mind. If I didn't have this I would defiantly not of exercised as much." (p031)

In populations with chronic respiratory disease (*n*=70) the implementation of a progress tracking screen acted as extrinsic motivation for participants. It was confirmed as a universal motivation across the lifespan by 9-18 year olds.

"A form of motivation would be a progress bar, [...] and over time you can see [how] well you improve" (Y12)

PRACTICAL RECOMMENDATIONS

1. Consider the use and implementation of technology. The practical barriers of the intended can limit adherence. i.e. Google HoloLens and exercise.
2. Implement detailed and humanistic visual guidance to support movement execution, Avatars are forms of gamification that can improve adherence as well as ensure safe execution of DHI.
3. Empower patients of all ages to track and review progress to unlock the powerful extrinsic motivation to adherence of DHI's.
4. Design DHI with an age bracket in mind, there are some transferable MA's, i.e. progress tracking. However, how MA's are deployed has been show to change depending on the age and condition of the patient.
5. Strongly consider implementing the possibility for user customisation of the avatar and app interface (e.g. backgrounds) for younger age groups, while older age groups need a more human-centered approach.

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