Journal of Virtual Worlds Research
jvwresearch.org ISSN: 1941-8477

Volume 6, Number 1
The Metaverse Assembled
April 2013

Virtual Worlds as a Tool to Facilitate Weight Management for Young People

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Abstract

Childhood obesity is a serious problem in the UK, with around 20% of children aged 10-11 being overweight or obese. Lifestyle interventions can be effective, but there is limited evidence of their effectiveness in delivering sustained weight loss. The present research explored potential of web-based, 3-dimensional virtual worlds (VWs) for facilitation of weight-management, well-being and patient and public involvement (PPI) for young people. Attendees of a weight management camp took part in induction sessions for use of the VW of Second Life. All participants successfully learned how to interact with one another and navigate the virtual environment. Participant appraisals of Second Life were varied. Some found it complicated and difficult to use, and some found it fun and the majority stated that they would choose to use VWs again. There is considerable potential for use of VWs to promote weight management, and Second Life or a similar VW could be used to deliver this. Potential barriers include members of the target sample having limited access to computers with necessary system requirements for running VWs, and that some may find VW-based educational experiences unappealing or challenging to navigate. For some however, VWs may provide a useful mode for provision of education, PPI and support relating to weight management.

1. Introduction

A considerable proportion of children in the UK (United Kingdom) are severely overweight. The scale of the current problem is such that experts are referring to it as a 'childhood obesity crisis' (Ben-Sefer, Ben-Natan, & Ehrenfeld, 2009). Approximately 10% of reception class children (aged 4-5 years) are obese, and this proportion rises to 20% of children in year 6 (aged 10-11) (National Statistics, 2012). In the UK, 17.1% boys and 14.8% of girls aged between 2 and 15 years of age are obese, and 3 out of 10 are overweight (National statistics, 2012). Although there is evidence that the previously steady increase of childhood obesity prevalence is now leveling out (National statistics, 2012), the extent of the problem remains a major concern, not least because obese children are likely to become obese adults (Serdula, et al., 1993). This contributes to the obesity epidemic being currently experienced, which is taking an enormous toll on the National Health Service (NHS) budget and the wider economy (obesity is estimated to cost $2 billion per year in sickness absence in the UK – National Audit Office, 2001) not to mention the health and wellbeing of many thousands of individuals affected. Obesity is a global problem that is well established in America and increasing in severity in India and China, as high calorie foods become more readily available to these populations (Friedman, 2009). Obesity presents a health risk to the individual through associated co-morbidities such as type-II diabetes (Sugerman, Wolfe, Sica, & Clore, 2003). There are two causes; an unhealthy diet (usually one high in fats and sugar and low in fiber) and lack of physical activity to burn off the calories consumed. There are numerous contributors to obesity including, but not limited to, genetics, environment, metabolic, biochemical, psychological, and physiological factors (Epstein, et al., 1995). The complexity of contributors to obesity mean that chance of intervention success is highest when treatments are complex and multi-faceted, so that a multitude of possible causes are addressed (McGovern, et al., 2008).

Lifestyle interventions for obese children that focus on administering healthy diets and increasing activity levels have been attempted, with varying success rates. A systematic review of non-surgical treatment options for pediatric obesity (McGovern, et al., 2008) identified some limited evidence for short-term efficacy of lifestyle interventions. Systematic reviews have also revealed a lack of robust empirical evidence for effectiveness of school-based diet interventions (T. Brown & Summerbell, 2009; Collins, Warren, Neve, McCoy, & Stokes, 2006). Results of two literature reviews demonstrate effectiveness of interventions that administer compulsory physical activity, but put into question extent that outcomes of such treatments can be sustained (T. Brown & Summerbell, 2009; Connelly, Duaso, & Butler, 2007).

Overall, the current evidence base for childhood obesity treatment is relatively weak (Paul J. Gately, et al., 2005). Lifestyle interventions appear to be effective within controlled environments, but beyond this, deliverable incentives and support for individuals can be more challenging to administer and effects of individual variables harder to measure. Weight management camps have been used in the United States of America and UK for administration of healthy diet and activity levels for overweight children in a controlled setting. The efficacy of weight management camps has been empirically demonstrated in terms of quantitative physiological, measures (Paul J. Gately, et al., 2005) as well as subjective, experience-focused perspectives (Hester, McKenna, & Gately, 2010). These camps have also been found to be effective in inducing healthier lifestyles and physiological benefits up to 10 months after the intervention, although there is still potential in improving longevity of sustained gains made by camp-based lifestyle interventions (P. J. Gately, Cooke, Butterly, Mackreth, & Carroll, 2000). The present article suggests information and communication technology facilities may be used to help to sustain improvements in health behaviors that result from successful lifestyle interventions such as weight-management camps.

Advances in information and communication technologies, along with the increased availability of more powerful computers and increasing ubiquity of broadband internet access mean

that there are now new ways to implement and deliver sustainable internet-based interventions to large numbers of people. Internet-based facilities could be provided for attendees of weight management camp interventions. These facilities could be used to motivate participants to sustain their achievements in weight loss through continued education, and could also allow users to meet with one another online after the end of the intervention with which they were involved. A virtual world (VW) could be used as a platform for provision of online education and social meetings. VWs are computer-generated environments that are accessed by multiple users. The environment is accessed using digital self-representations known as 'avatars'. The benefits of VW for education have been demonstrated (Hall, Conboy-Hill, & Taylor, 2011; Patel, et al., 2012; Wiecha, Heyden, Sternthal, & Merialdi, 2010) and future potential for its use for health related benefits have also been articulated (Boulos, Hetherington, & Wheeler, 2007; Gorini, Gaggioli, Vigna, & Riva, 2008).

VWs also have a great deal of potential for aiding Patient and Public Involvement (PPI) as they provide a medium for people to feed back about their experience of receiving care, hold group engagement sessions or conduct meetings. The Collaboration for Leadership in Applied Health Research and Care (CLAHRC) for North West London have their own space on the 3-dimensional virtual world of Second Life (http://slurl.com/secondlife/HealthLands/93/137/131), which contains meeting rooms and a conference centre available for patients and the public to use as they wish.

An exclusive 3-dimensional VW for weight management camp attendees could be created, which could convey educational information regarding weight management whilst being fun to use. This could be made available for camp attendees to use during their period of attendance at the camp, as well as after they depart. The environment could contain educational materials that convey information about diet and activity recommendations and also provide a space for users to be able to socialize with one another. Attendees would be able to use such a tool to stay in contact with people who have met at the camp after they leave. Interventions could be delivered in the virtual environment using Behavior Change principles, such as Cognitive Behavioral Therapy to help people reduce unwanted behaviors (such as unhealthy eating habits) and motivational interviews could be carried out. The environment could be manipulated with the aim of inducing implicit learning and goal-directed behaviors. Users could be primed with imagery relating to healthy behaviors and could take part in simulated experiences that provide weight management education such as a tour of a virtual restaurant with information on how to choose a balanced, healthy meal when eating out.

The cost of maintaining a virtual space to be used in this way would be minimal, especially in comparison to alternative 'real world' lifestyle interventions. It could also be used as a mode through which a form of PPI could occur, where previous camp attendees could feed back about their experiences of attending the weight management camp and about any health-related concerns or issues they may have, which could be used to improve related services. Dissemination of other PPI-related findings may lead to improvements in other healthcare sectors.

There is a wealth of evidence in the field of Social Psychology that suggests we judge our actions and perceptions by comparing them to those around us, (G. D. A. Brown, Gardner, Oswald, & Qian, 2008) especially those who are similar to us (Goldstein, Cialdini, & Griskevicius, 2008). A group of people who had all previously attended the same summer weight management camp may be more likely to continue the healthy lifestyle they had learned to lead, by continuing to meet one another in a virtual environment after their time at the camp has ended, and encourage one another to maintain their achievements in weight loss and quality of health. Peer support groups could be set up for people who encounter barriers with maintaining the health gains they had achieved, and health experts could even meet people online in a virtual environment for targeted follow-up support (Gorini, et al., 2008).

This project aimed to investigate the potential of web-based, interactive 3-dimensional virtual environments for facilitating weight management, well-being and PPI for young people as part of a weight-loss lifestyle intervention. The objective of the present study was to introduce a group of weight management camp attendees to the web-based 3-dimensional virtual world of 'Second Life' and assess their initial perceptions of the VW, and the idea of using it in future for educational or recreational means. The present study did not aim to directly improve the weight loss or health behaviors of the sample, but to investigate participants' views of using VWs, so that VWs could be built which could aim to facilitate health behavior change in the future.

Participants were attendees of the Carnegie Weight Management (CWM) summer camp. CWM (now known as 'MoreLife'[http://www.more-life.co.uk/]) is recognized by the UK Department of Health and is the only academic institution in the UK that provides weight management services for children. A group of young people in attendance of this camp learned how to use Second Life, took part in in-world collaborative activities and reported their quality of experience. The authors predicted that most of the young people in this sample would not have used 3-dimensional web-based VWs before, and these introductory sessions aimed to gauge initial feedback from participants.

2. Methods

The present study aimed to measure participants' initial reactions to use of virtual worlds. All participants took part in a session where they navigated a 3-dimensional virtual world. They then completed questionnaires and took part in a group discussion regarding their experiences.

2.1 Materials

Second Life: The virtual world used in this study was Second Life (http://secondlife.com/). Second Life is internet-based, publically accessible and provides a virtual environment that adheres to real-world 3-dimensional topography. Users of Second Life can communicate with one another verbally using computer-connected microphones or by typing written messages. It is possible to restrict access to particular regions to specific groups of users, which can be useful for the provision of exclusive, controlled environments. Second Life has been used by multiple organizations for a variety of communication-related purposes (Leong, Kinross, Taylor, & Purkayastha, 2008).

There are multiple online virtual worlds, and at the time of testing, Second Life appeared to be the most user-friendly and easy to access. Additionally, previous studies have demonstrated successful weight-loss interventions using Second Life (Johnston, Massey, DeVaneaux, & CEO, 2012) and Second Life has been demonstrated to be useful for education and training purposes (Cohen, et al., 2013; Patel, et al., 2012; Taylor, et al., 2011), validating its potential for use in teaching and for eliciting positive health behavior change.

Use of Second Life is generally only permitted for adults, but people 13 years of age or older are permitted to use Second Life thorough an affiliated organization if controls are in place to ensure that they stay within the restricted confines of virtual space owned by that organization. An area of virtual land within part of Second Life that is owned by CLAHRC for North West London in affiliation with Imperial College London was made private for the introduction sessions for the camp attendees.

This space contained a virtual ice-rink, where users could make their avatars skate. There was a 'magic carpet' and a hot air balloon set up in the area, both of which were available for users to ride and control together. A 'snowball machine' made it possible for users to have a virtual snowball fight and there was a virtual house that the participants could explore.

Figure 1: Participants could make their avatars ice skate together in Second Life

Presence: The level of presence refers to the extent to which people experience an artificial environment as being real (Sheridan, 1994). Participants in the present study completed a scale designed to measure the presence they experienced whilst using Second Life, taken from (Fox, Bailenson, & Binney, 2009). See Appendix A for full list of questions that were used.

Presence influences perceptions and behavior induced by virtual environments (Fox et al, 2009). It was measured in this study to gauge an understanding of the extent to which participants felt immersed in the environment when using Second Life and to investigate whether it was linked to participants' subjective reports of the quality of their experience.

2.2 Participants

A total of 22 young people took part. All participants were between 13 and 17 years of age (M = 14.6, SD = 1.3). Six were male and 16 were female. All were attendees of the Carnegie Weight Management (CWM) camp in Leeds. All participants over the age of 13 years of age who were in attendance of the CWM at the time of testing took part in the study.

2.3 Procedure

Three Second Life induction sessions were run for 3 separate groups; each group comprising of 7-8 participants. Each of these sessions lasted approximately 90 minutes, and 2 members of the researcher team plus one CWM Camp facilitators acted as facilitators.

At the start of the session, each participant sat at a desk where a laptop was set up, upon which Second Life installed. A headset with earphones and a microphone was also connected to each computer. A, presentation was then given by one of the researchers to introduce Virtual Worlds in general, and Second Life in particular. The researchers then guided the participants through the steps of setting up an account on Second Life (through an Imperial College portal, so that the participants would only be able to access the privately designated virtual space within Second Life) and creating an avatar, after which the participants then logged in to Second Life.

The participants were then taught how to alter the appearance of their avatar, how to move their avatar around the virtual environment and how to communicate with one another. Participants then used Second Life as they wished, and could focus on communicating with one another, continuing to adjust the appearance of their avatars or taking part in collaborative activities such as riding a hot air balloon and ice-skating.

Approximately 1 hour into the session, participants logged out of Second Life and completed 2 short questionnaires. The first contained questions regarding their previous experience of using computers, access to computer- and internet-facilities, and initial impressions of using Second Life. The second was the presence scale described above. After questionnaires had been completed, each of the 3 groups took part in discussion sessions. The groups were asked a semi-structured set of questions by the session facilitators, which focused on themes similar to the questionnaire. The purpose of these sessions was to collect additional qualitative data to supplement data gathered using the questionnaires. Having group discussion sessions rather than talking to participants individually may have resulted in individuals influencing one another to communicate ideas and suggestions that they would not have made if they were alone. The fact that the questionnaires were completed before the discussions means that the questionnaire data represent participants' individual, unbiased opinions.

3. Results

All 22 of the participants were able to create an account on Second Life, were able to navigate the virtual environment by moving their avatar around, alter their avatar's appearance and communicate with one another using voice and written messages.

3.1 General feedback regarding use of virtual worlds

Twenty-one participants completed a questionnaire where they reported general feedback on the introduction session that they experienced.

Table 1: Answers to questions regarding computer use

Question	Yes	No
Do you have access to a computer at home?	19	2
Do you have internet access at home?	20	1
Do you use computers to word process?	17	4
Do you use computers to send and receive emails?	18	3
Do you use computers for social networking? (e.g. using Facebook)	19	2
Do you use computers for voice conferencing? (e.g. Skype)	11	10
Do you use computers to play online games?	18	3

Table 2: Answers to questions regarding previous experience of using virtual worlds

Question	Yes	No
Had you heard of virtual worlds before taking part in this study?	16	5
Do any of your friends use virtual worlds	13	8
Had you heard of Second Life before taking part in this study?	4	7
Had you used virtual worlds before taking part in this study?	9	2
Had you ever used Second Life before taking part in this study?	1	0

Table 3: Answers to questions regarding future use of virtual worlds (DNA = did not answer)

Question	Yes	No	DNA
Would you communicate with one of your friends using virtual worlds?	8	9	4
Would you communicate with a group of your friends using virtual worlds?	8	9	4
Would you be interested in using virtual worlds again?	14	7	0

3.2 Answers to the question 'Would you communicate with a group of friends using virtual worlds?'

Of the 8 participants who answered 'yes', 5 cited reasons relating to Second Life being interesting or fun.

"Yes, because it's fun"

"Yes, because you could do an activity together"

Of the 9 who answered 'no', 5 cited reasons relating to MSN messenger or Facebook being preferable. Three left feedback that stated that they found Second Life complicated or difficult to use.

"Not really, because I use MSN or Facebook"

"No, Skype/MSN is much easier to you & doesn't need full attention"

3.3 Presence scores

Twenty-two participants completed a questionnaire where they reported the level of 'presence' that they experienced whilst using Second Life. The presence scale consisted of 10 items. Each item was scored from 1 (strongly disagree, indicating low presence experienced on the relevant dimension)-7 (strongly agree- high level of presence experienced). The presence scores present the sum of these items divided by the number of items (10).

The Mean presence score was 2.69 (*SD* = 1.76). The presence scores were positive predictors of whether or not participants expressed interest in using virtual worlds again (X^2 [1] = 8.811, p = .003), with those reporting they would use Second Life again having a higher presence score (M = 3.48, SD = 1.66, n = 14) than those who reported they would not use Second Life again (M=1.17, SD = .0237,

n = 7).

3.4 Group discussion sessions

Group discussion sessions were recorded and transcribed. The main themes are summarised below.

The virtual environment, graphics and lag: Individuals in 2 of the 3 groups commented that they were unimpressed by the quality of the graphics in Second Life. A participant in one of these groups commented that the quality of the graphical representation of objects in Second Life resulted in a 'less realistic' experience. One individual commented that his experience was hampered as a result of the lag that he experienced whilst making his avatar fly across the environment.

Avatars: Many participants opted to spend much of their time adjusting the appearance of their avatars, but some commented that it was challenging to do this:

'When you kind of change you appearance, you have to do a lot of things just to change your appearance'

'I didn't know where my hair went or how to get it back'

Second Life as a method of communication: Comparisons to alternative methods of social networking were made by individuals in 2 of the 3 group discussions. MSN messenger, Skype and Facebook were cited as examples of web-based communication that are easier to use than Second Life. The groups were asked if they had any thoughts on group educational activities being carried out in Second Life. One participant commented that this could result in the loss of important aspects of interpersonal face-to-face communication.

'I wouldn't want to sit like in a classroom, on a computer in a virtual world and I'd rather interact with my friends and my teacher in person because I think we are people rather than just little characters on a screen.'

It was suggested in one of the group discussions that Second Life could be used for educational interactions between CWM Camp facilitators and camp attendees, and it was suggested that because in this setting Facebook and phone contact would not be appropriate, that Second Life may provide a viable solution. One participant suggested that it may be beneficial for lifestyle education to be represented in an online CWM virtual world facility, and that 'group discussion boards' could be represented and used within this environment.

4. Discussion

The aim of this project was to explore the potential of web-based, interactive 3-dimensional VWs for facilitating weight management, wellbeing and PPI for young people as part of a weight-loss lifestyle intervention. This was explored by introducing young people who were attending a UK weight management camp to the virtual world of Second Life and documenting their initial reactions to using this virtual world. Participants' previous experience of using virtual worlds and access to computer- and internet-facilities at home was also recorded.

4.1 Accessibility

Twenty of the 22 participants reported having computer and internet access at home, which means that it is likely that the majority of these individuals would be able to access a virtual world of some kind from their homes without any additional equipment. Nine of the participants reported having used VWs before, and 1 stated that they had used Second Life.

Evaluations of quality of experience when using the virtual world by the young people who took part in the introduction sessions were mixed. Fourteen participants said they would be happy to use virtual worlds again and 7 said they would not (1 did not answer this question).

It would appear, therefore, that most participants in this sample do have both the access to necessary system requirements and the desire to use virtual worlds, which indicates that a web-based virtual environment for weight management camp attendees may be used by a substantial proportion of individuals in this population. It also appears to be the case, however, that the prospect of using VWs does not appeal to everyone in this sample, so it is important to continue to consider any possible VW facility that gets created and used as an adjunct to other possible sustainability tools. It is important that those who do not have the desire or equipment to use VWs still have access to the same high quality, reliable and accessible health education and PPI resources.

4.2 Social networking in a virtual world

Of the reasons that participants cited as to why they would not use virtual worlds to meet with their friends, the most common was that Facebook and MSN Messenger are easier to use. An equal number of participants, however, reported that they found the virtual environment to be interesting or fun and that they would use it again and to meet friends for this reason. All participants were able to use their avatars to interact with one another and navigate the environment within 20 minutes of creating an account, though some participants reported finding Second Life challenging to use. If any VW-based tool were to be made available to CWM camp attendees, training and support would need to be ensured for users to help those who find use of VWs to be challenging. Qualitative data collected from the group discussion sessions suggests that although Second Life may be more difficult to use than alternative forms of social networking, which may result in some individuals refraining from using it, if it were to allow for educational interactions between staff at the CWM and previous camp attendees then this would provide an camp attendees important incentive to use a CWM VW facility. It may be that the ability to communicate with friends using virtual worlds should be seen as an additional advantage of facilitating weight management interventions using this technology, with the focus of the intervention being the educational activities with CWM camp facilitators.

4.3 Age restrictions of Second Life

At present, Second Life is the most accessible, user-friendly VW available, but its use is generally restricted for under-18s. New, similar virtual worlds could be created that would not have user restrictions and could be made available only to users that had taken part in the particular lifestyle intervention under question, such as a weight-management camp. It is also possible to develop interactive virtual environments that can be accessed through an internet-browser window, which could alleviate the age restriction issue, as well as enhancing accessibility.

4.4 Presence

The minimum possible mean presence score was 1 and the maximum was 7. Individuals with a mean score of 2 or less would have strongly disagreed or disagreed to most of the questions (see Appendix A for presence scale questions), so those who reported that they would not use virtual worlds again appear to have experience almost no immersion in the virtual environment at all during the session. The overall average of the group was also relatively low, so it is reasonable to infer that the majority of participants were not heavily immersed in the virtual environment. This is, perhaps, unsurprising considering that participants were all in the same room in real life while using Second Life, and were often interacting with the session facilitators face-to-face. If each of the participants were in a different room with their computer and in communication with each other through Second Life simultaneously, then perhaps presence scores would have been higher. The results of the group

discussion sessions also identified several other factors that may have reduced participants' subjective feelings on presence. Some participants did not think the graphic were of good quality, with one in particular explicitly stating that this led to a less realistic experience. Another participant reported that they experienced lag.

There is evidence that presence can increase efficacy of VWs in facilitating beneficial health behaviors (Fox, et al., 2009) so it may be advantageous to consider how a web-based VW could be constructed with the aim of it creating a high degree of user immersion than Second Life. Further work could possibly look into investigating cause-and-effect between presence and positive views of using virtual worlds.

It may be the case that people who were positively disposed to using virtual worlds became more immersed in the experience as a result of this and thus reported greater presence scores. It may also be the case, however, that a more immersive virtual environment significantly increases quality of experience for all. If this is the case, then it is worth keeping in mind when designing virtual world facilities.

4.5 Virtual worlds to aid health behavior change

Potential of specifically tailored virtual environments for inducement of positive mood, behavior change and wellbeing is well established (R. Baños, et al., 2012; R. M. Baños, et al., 2012; Fox, et al., 2009) and VWs such as Second Life have previously been found to be a highly effective environment for the improvement of health and weight-management related behaviors (Johnston, et al., 2012). Online weight management peer support communities have been demonstrated to play a prominent and positive role in individuals' weight loss efforts (Hwang, et al., 2010), suggesting that if this aspect was built in to a virtual world which aimed to facilitate weight management, then this could lead to a strengthening of the positive effects on health behaviors that may result from the intervention.

The present study did not aim to improve the weight loss or health behaviors of the sample and the collaborative activities that the participants conducted in the virtual world were not designed to be educationally beneficial or to induce behavior change. Such activities could be created and tested in future studies. There are indications as to how such activities could have a positive effect on health behavior change that can be gained from previous research. Virtual world experiences have been effectively used for education, through simulation of real experiences (Patel, et al., 2012). Educational experiences relating to diet and exercise could also be created in a virtual world. Users could make their avatars exercise on a virtual treadmill for a given time to learn how much work they would have to do to use a certain amount of calories. Health behavior change through the 'Proteus effect' (conforming behavior towards that of a digital self-representation) has been demonstrated (Fox & Bailenson, 2009), and this effect has been found to be potentially mediated by presence (Fox, et al., 2009). This suggests that a person who watches their avatar conducting exercise may become more likely to conduct exercise themselves. A virtual environment with fun activities for users that involve their avatars conducting physical activity, such as sports games, may lead to these users becoming more physically active themselves. Efficacy of group lifestyle coaching sessions in VWs has also been demonstrated (Johnston, et al., 2012). Lifestyle coaching sessions that advice people who previously attended a weight-management camp on how to sustain their improved weight and health behaviors may also lead to sustained weight loss.

There has been considerable research investigating the efficacy of general internet-based weight loss interventions, and success rates have been mixed (Norman, et al., 2007), although the variation in designs in previous studies can make it difficult to draw general conclusions concerning web-based interventions in general (Neve, Morgan, Jones, & Collins, 2010). There is evidence for a trend, however, for theory-driven interventions to be more successful (Webb, Joseph, Yardley, &

Michie, 2010), and there is evidence for the efficacy of structured, therapist-led approach with a focus on behavior change (Gold, Burke, Pintauro, Buzzell, & Harvey-Berino, 2007; Khaylis, Yiaslas, Bergstrom, & Gore-Felton, 2010). VWs would provide an ideal context for provision of such sessions, and future research could provide further investigation into this possibility to facilitate lifestyle change for obese adolescents. It was suggested in one of the group discussion sessions that a potential disadvantage of using virtual worlds to provide group educational experiences is the lack of quality of interpersonal interaction compared to face-to-face communication, and that it is better to interact with 'real' people than through avatars. This is related to the earlier section on presence, as a greater level of presence experienced by an individual will result in a virtual situation being experienced as more 'real'. But even if individuals are interacting with one another in a VW whilst experiencing a high degree of presence, VW interaction is not as intimate as face-to-face interaction. This can be advantageous in some ways and disadvantageous in others in the context of health-related educational delivery, and the extent to which this factor enhances or diminishes quality of user experience depends very much upon the user requirements and the particular educational situation in question. When face-to-face education is preferable, it is not always feasible or possible, such as for previous attendees of CWM who may benefit from additional lifestyle education from camp facilitators, but who live in different parts of the UK. Virtual worlds may provide a feasible platform for delivery of high quality remote education for these individuals.

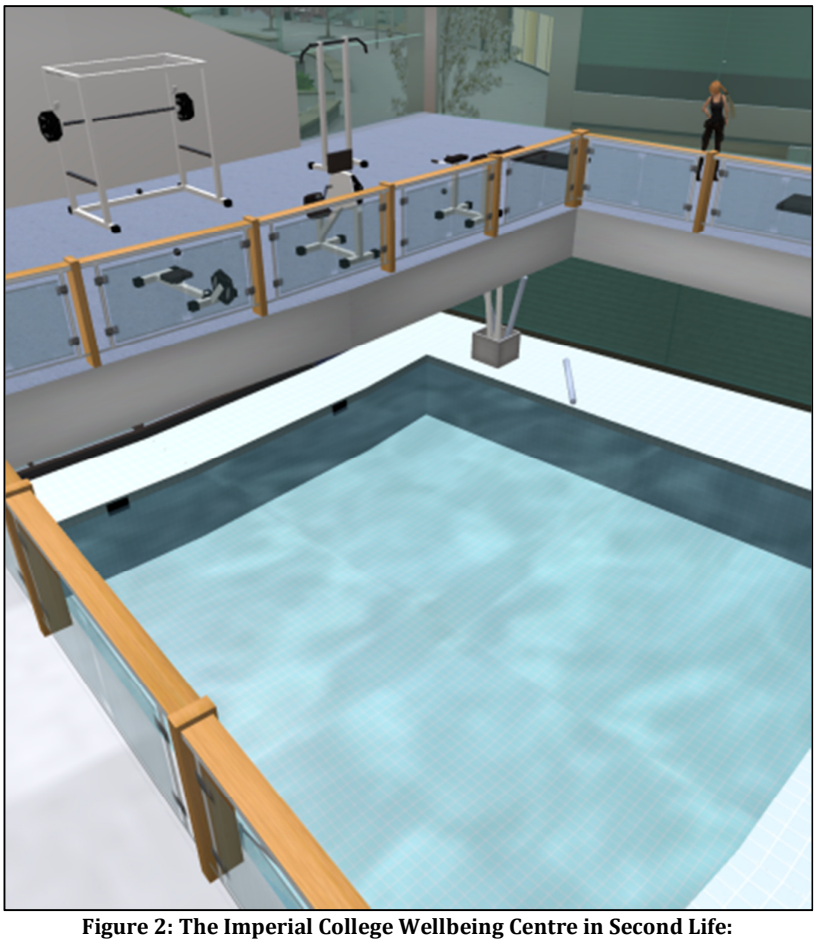

Figure 2: The Imperial College Wellbeing Centre in Second Life:

4.6 Conclusions

There is a huge amount of potential for use of virtual worlds to facilitate weight management, well-being and PPI for young people. This study provides information regarding the initial reactions

from a sample that may benefit from this intervention. The specificity of the sample (young people attending a weight management camp in the UK between the ages of 13 and 17) necessarily meant that the sample size was relatively small, but the feedback from this sample will be useful in consideration for further plans to use VWs in facilitating lifestyle interventions that target weight loss and related health innovations.

The above-described findings suggest that if a web-based VW facility was created for attendees of a weight management camp, or similar weight management intervention for young people, then this facility may be used by a substantial proportion of those involved in the intervention. This indicates that the provision of a virtual environment aiming to facilitate sustainability of healthy lifestyle interventions may be of considerable benefit to those involved.

Disclosure

The authors declare no conflict of interest. This article presents independent research commissioned by the National Institute for Health Research (NIHR) under the Collaborations for Leadership in Applied Health Research and Care (CLAHRC) programme for North West London. The views expressed in this publication are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

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Appendix A: Presence questionnaire

Please follow the key given below and circle the number corresponding to your views.

1 Strongly disagree	2	3	4	5	6	7 Strongly agree

1.To what extent do you feel the avatar is an extension of yourself?	1	2	3	4	5	6	7
2.To what extent do you feel that if something happens to the avatar, it feels like it is happening to you?	1	2	3	4	5	6	7
3.To what extent do you feel you embodied the avatar?	1	2	3	4	5	6	7
4.To what extent do you feel you were in the same room with the avatar?	1	2	3	4	5	6	7
5.To what extent did the avatar seem real?	1	2	3	4	5	6	7
6.To what extent were you involved with the virtual world?	1	2	3	4	5	6	7
7.To what extent did you feel surrounded by the virtual world?	1	2	3	4	5	6	7
8.To what extent did you feel like you were inside the virtual world?	1	2	3	4	5	6	7
9.To what extent did it feel like you visited another place?	1	2	3	4	5	6	7
10. How much did the virtual world seem like the real world?	1	2	3	4	5	6	7