

Northumbria Research Link

Citation: Mohamad, Mostafa and Cresswell, Montana (2019) Technology as tool to overcome barriers of using fitness facilities: A health behavioural perspective. In: BAM2019 Conference Proceedings. BAM, london, pp. 1-31. ISBN 9780995641327

Published by: BAM

URL: <https://www.bam.ac.uk/sites/bam.ac.uk/files/contribution975.pdf>

This version was downloaded from Northumbria Research Link:
<http://nrl.northumbria.ac.uk/id/eprint/42910/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)



**BRITISH ACADEMY
OF MANAGEMENT**

BAM
CONFERENCE

3RD-5TH SEPTEMBER

ASTON UNIVERSITY BIRMINGHAM UNITED KINGDOM

This paper is from the BAM2019 Conference Proceedings

About BAM

The British Academy of Management (BAM) is the leading authority on the academic field of management in the UK, supporting and representing the community of scholars and engaging with international peers.

<http://www.bam.ac.uk/>

Technology as tool to overcome barriers of using fitness facilities: A health behavioural perspective

Abstract

Underlying health conditions have been highlighted throughout the literature preventing several populations from engaging in physical activity. There have been little to no attempts made in addressing these populations directly in fitness facilities or indirectly using information technology (IT). The current research aimed at exploring current barriers and practices regarding IT and technological support in a fitness facility environment, using health behaviour theories (HBT) to explain member experiences. The sample was composed of 66 participants selected from 5 fitness facilities in Manchester, UK, of which there were 60.6% males and 39.4% females aged from 18-59. The instrument used was a survey. Health motives were reported by 71.2% of the participants, while 'injury' (reported by 70.2%), 'lack of knowledge about exercise and health' (reported by 42.4%), and 'illness' (reported by 28.1%) as main barriers to use the facilities. The main support mechanisms provided by the facilities management were staff support (59%), with online and technological support only accounting for 38.6% of facility support. The use of personal IT within the facilities were utilised by over half the participants (50.2%). The study revealed the need of additional IT support by fitness facilities in the form of applications and digital platforms. The findings are discussed with HBT as the theoretical underpinnings and suggestions are made for future research regarding IT advancements as support mechanisms.

Keywords: Health behaviour theories, Health belief model, Theory of planned behaviour, Transtheoretical model, fitness technology, fitness facility management

1. Introduction

Fitness facilities (also known as gyms or health clubs) are increasing in numbers at a rapid rate. In the '2017 State of the UK Fitness Industry Report' it was revealed that there were over 9.7 million fitness members in the United Kingdom, with a 5.1% increase in the number of members, an 4.6% increase in the number of fitness facilities and 6.3% increase in market value estimated at £4.7 billion (State of the UK Fitness Industry Report, 2017). This evidence provides the numerical significance of the industry growth; however, the current study aims to focus more on the perceptions of the members with regards to the several barriers identified in the literature. The methodology utilised to achieve the desired outcomes therefore drew focus on gaining an insight into their preferences and motivations. Health-related barriers specifically were of interest to the current research as this was an underlying element found throughout the noted barriers within the literature. These health-related barriers not only prevent members from utilising the services within a facility but also in hand creates a burden on the health care system, as many of these populations seek medical advice and treatment due to underlying conditions (Boseley, 2018; Guzman-Castillo et al, 2017). The concept of health behaviour theories (HBT) provided the theoretical underpinnings to the current study in order to understand factors which explain the exercise behaviour of members. This is an important aspect required for fitness facilities to adapt and provide services that meet their members' needs. The services within a fitness facility range from support provided in various forms such as from staff, online, technological or written. The literature reveals some investigation into social and environmental adaptations done by fitness facilities in order to address barriers and Information Technology (IT) has been extensively explored throughout literature as adequate support structures to health and fitness. IT adaptations and advancements, however, are yet to be explored as a support mechanism provided by fitness facilities.

To address this phenomenon, our research explores the extent to which IT have been used by fitness management to provide alternative set of support, specifically technological support to enhance the customer's experience and engagement in the services provided. Accordingly, this paper managed to answer two main research questions;

- **RQ1:** *To what extent are customers of fitness facilities are engaged in the provided services?*
- **RQ2:** *How do facilities' management enhance customers engagement in the services provided?*

2. Literature Review

2.1. Barriers to physical activity

Physical activity has been shown as an essential aspect for good health and wellbeing, with several benefits for an individual and society in the form of social, mental and physical aspects (Annesi, 2001). People are becoming increasingly aware of health issues and wellbeing and therefore the idealisation of 'healthy' and 'fit' has become more attractive with the adoption of a healthy lifestyle providing countless benefits (Goncalves et al, 2012). However, several barriers exist preventing members from fully engaging in physical activity in a fitness facility environment (Holman et al, 1996) including; transportation, childcare, financial concerns, community environment, accessibility, time-constraints, pregnancy, old age, disability, obesity, injury and discrimination within the gym environment (Guerin et al, 2003; Richter et al, 2002; Rimmer et al, 2004; Kehn & Kroll, 2009; Rolfe et al, 2009; Sendi & Kebler-kefo, 2009; Evenson et al, 2009; Mauro et al, 2008; Miles & Panton, 2006). Scattered amidst all the literature identifying barriers to physical activity was a common theme where health-related concerns were mentioned as serving as a barrier to engaging in physical activity. This research has therefore taken focus on the extent that health concerns serve as a barrier to physical activity and accessibility to fitness facilities.

Research has revealed that despite benefits of exercise in people with illness or disease (Chimen et al, 2012), the number of people who are active are very low. Investigations reveal that people with underlying health conditions have identified the fear and lack of control of their conditions while exercising (Brazeau et al, 2008; Ussher et al, 2007; Sallis et al, 2012; Schuelter-Travisol et al, 2012). A lack of knowledge and support have also been highlighted in these populations as a barrier preventing the access of fitness facilities or ability to exercise within (Lascar et al, 2014; Deargrance et al, 2003; Evenson et al, 2009; Letts et al, 2011; Juarbe et al, 2002; Bopp et al, 2006; Verhijden et al, 2005). The strain that these health concerns place on the health system in the UK is immense and reported to continue to grow (Boseley, 2018; Guzman-Castillio et al, 2017); making the need to increase physical activity amongst these populations a priority.

A definition for the 'average gym member' has been developed in this research based on the literature, as someone who has no underlying health conditions. Environment and social adaptations have been thoroughly identified and explored throughout literature with recommendations being made and key issues discussed (Richter et al, 2002; Gallant & Dorn,

2001; Kumanyika et al, 2007; Sendi & Kerbler-kefo, 2009; Burns, 2004; Harrison, 2004; Thomas, 2004; Harrison & Davis, 2001; Rimmer et al, 2004). There was however no literature found on IT solutions to addressing health conditions within fitness facilities.

2.2 Digital Fitness

Interactive fitness equipment had been developed due to the advancement in technology; changing the way people exercise (Sullivan & Lachman, 2017). This includes the hardware and software incorporations ranging from applications, monitors, online sources and assistive technology. Research reveals that there is an increased use on IT as a support mechanism by members (Patel & Kane, 2015). The increase in popularity and availability of personal informatics has been demonstrated in research and design. This includes the growth of fitness applications for smartphones alongside wearable standalone devices. Examples can be seen in ubiquitous computing tools (Albinali et al, 2010), fitness device infrastructure (Gupta & Jilla, 2011), virtual trainers (Buttussi et al, 2006) as well as interactive social computer games (Lin et al, 2006). Rooksby et al (2014) discovered that people tend to interweave their use of technological trackers and a depth of exploratory research has been done on why people use various technologies during their exercise regimes.

Fitness technology in most commercial apps aims at addressing aspects such as goal setting, feedback, rewards, self-monitoring and social support (Mercer et al, 2016), however less than half of the many apps available include these strategies (Conroy et al, 2014). The apps which did include these aspects have been associated with better outcomes, such as greater increases in physical activity and weight loss (Greaves et al, 2011). Mobile health apps have been designed to improve health outcomes through the measurement and monitoring of health conditions (Yardley et al, 2016). There is also an increase in the availability of new commercial health and fitness technology (Gittleson, 2013). Physical activity monitors are key elements of information which can provide a member with guidelines while exercising (Freedson et al, 2012, Welk et al, 2000). There is some uncertainty however in what conditions apps provide the best data with regards to accuracy variations amongst users (Schrack et al, 2016; Schrack et al, 2015).

There is a rich volume of research demonstrating the use and benefits of social media and online resources in health and fitness. Frimming et al (2011) found that 51.1% of their

respondents found long term use of social media benefited their fitness routines; feeling more informed, were able to learn from their peers.

Research has been done in different contexts regarding the benefits and use of IT; such as in the workplace (Bardram, 1997) or homes (Blythe & Monk, 2002). Patel and Kane (2015) explored the use and non-use of digital technologies in a gym. They found that the gym environment was complex and dynamic, and that people used technology for various needs based on their individual preferences. Their findings were in line with Rooksby et al (2014) with regards to the difference's individuals used technology. There is however a lack of research investigating what IT is provided by fitness facilities and furthermore, what IT is provided by fitness facilities as a support tool for their members.

2.3 Theoretical underpinnings

With the competitive nature of the fitness industry and the number of new fitness facilities opening; it is crucial that managers not only are able to attract new members; but retain their current members. More than half of fitness facility members cancel contracts in the first 12 months, mainly due to the non-creation of a training habit alongside the lack of motivation inherent in not being able to fulfil their proposed objectives (de Oliveira, 2018). Many organisations have sought strategies in order to retain their 'at-risk' customers and also recover lost customers (Ang & Buttle, 2006), where the most meaningful strategies are those strategies which have placed building partnerships with existing members as their highest priority (Jamieson, 1994). Schmittlein (1996) have calculated that gaining new customers can be nearly five times greater than the cost of retaining existing customers, hence retention is a small price when compared to acquiring new ones (Surajlal & Dhurup, 2011). Retention is therefore seen to be the single biggest predictor of future profitability (Peterson et al, 1997). Surujlal and Dhurup (2011) found most health and fitness organisations do not communicate regularly with their customers. To develop an effective retention strategy, relationships need to be developed by having an in-depth knowledge of customers and their expectations and aim to continuously add value to their needs (Surujlala & Dhurup, 2011). However, health conditions present barriers which prevent the ability of these populations to engage in physical activity in the facilities and hence the reasons for their behaviours need to be understood.

The concept of health behaviour theories (HBT) is an important aspect for fitness facilities to consider; as understanding the factors which underlie exercise behaviour in members, will

prove beneficial in interventions designed to address their needs. Cognitive perspective theories include the Health Belief Model (Hochbaum et al, 1952) and the Theory of Planned Behaviour (Ajzen, 1991) amongst others. These theories focus on the cognitive variables as part of a behavioural change, where they assume attitudes and belief (Stroebe, 2011) alongside expectations of future events and outcomes (Gebhardt & Maes, 2001) determine health related behaviour. They ultimately propose that individuals will select their actions based on what will most likely lead to a positive outcome (Munro et al, 2007). While other models of behaviour change draw focus on certain dimensions of change, the Transtheoretical Model (TTM) uses temporal dimensions emerged from psychotherapy and behaviour change (Prochaska & Velicer, 1997) to identify and integrate key constructs from a variety of theories into a comprehensive theory of change and the stages experienced when encountering change.

There is limited literature on member behaviour in fitness facilities regarding support provided by facilities; specifically, IT support mechanisms. It is hoped through health behaviour theories; member experiences can be explained in order ascertain their needs regarding this concern, by understanding the constituents which elicit behaviours.

3. Research Methods

3.1. Research Approach

With epistemological considerations being given, the research has been conducted using an interpretivism position. The reason behind the interpretivism stance was based on the hope to gain insight into the members experiences and allow the researcher to identify key aspects which may be affecting a members' ability to exercise, required support and how this can be addressed using IT. With ontological considerations being given, the research is considered as constructivism in nature, where reality is perceived as subjective. The researcher was placed within the participants setting, with focus on a single concept (IT as a support mechanism) and where participants were able to share meanings and individual values, so the researcher could interpret and create an agenda for change or reform.

3.2 Sample Selection

Members were contacted by the researchers directly through social media websites (SMW's), namely; Instagram, Facebook and Twitter. They were contacted independently of fitness facility interaction in order to avoid bias selection or interference made by the facility of member participation as well as for participants to not feel organisational pressure as the research was being conducted privately for research purposes and not for marketing or competitive advantage; elements shown as off-putting for participation in surveys. For example, Fan and Yan (2010) asserted that surveys sponsored by academic or governmental agencies had higher response rates than those that were commercially sponsored.

Convenience sampling was adopted for the participant sample selection; based on meeting the target population criteria such as having a social media website account, interaction, location tag, hashtag or mention of a selected fitness facility. No specific criteria were set for barriers; as this was an aspect the current research hoped to explore with regards to the extent these elements existed within the chosen location. They were sent a message inviting them to take part in the research. Once participants who were contacted expressed their interest, a survey link was sent.

SMW are emerging as valuable researching tools, as they present the opportunity for researchers to contact with participants. SMW have been used in several studies. For example; Twitter has been used in studies to reveal patient experiences in aspects such as pain (Heavillan & Gerbert, 2011) and smoking cessation (Prochaska et al, 2012), as well as demonstrating data in pandemics (Chew & Eysenbach, 2010). SMW were used for this research based on the desire to explore IT and hence, members who were already familiar with SMW provided this sample of members.

The research was based on data gathered from 5 fitness facilities chains located in Central Manchester, United Kingdom. The participants were members of the fitness centres. There was a total of 550 messages were sent via SMW with a total of 120 replies (21.8% of the numbers sent); 98 survey links sent and 81 returned (82.65% of the number delivered). Of these 81, 66 met all inclusion criteria and were included in this research. Due to the nature of the research which was hoping to gain insight and reason from the members and not statistically analysing the data; the number of participants could be less than most survey responses reported in the literature.

3.3. Data Gathering Strategy

Internet-based methodologies have become more popular by researchers due to the accessibility to ordinary people and not only those who are technically advanced (Wellman, 2004). Despite not having as high a response rate as other methods of delivery (Shannon & Bradshaw, 2002) the processes of questionnaires have become more user-friendly through the use of online surveys, which have streamlined the design and data collection processes as well as reduction in costs (Andrew et al, 2003; McPeake et al, 2014). These reasons therefore justified this method as a good information gathering technique; as the number of responses was not of critical concern due to the nature of the research. It was also hoped that response rates would not be heavily effected due to the topic of the research (Dillman, 2011). The theme was focused on IT support and hence the populations who were found on SMW were presumed to be more aware of the online environment compared to those not active online. Elements such as length of the survey (Liu & Wronski, 2017), the design and approach of participants (Crawford & Pope, 2005) and strategies such as reminders (Yan & Fan, 2010; Spruyt & Van Droogenbroeck, 2014) were also utilised throughout the data gathering process in order to encourage participation and hence response rate.

There are several survey software programs (Alessi & Martin, 2010) which offer similar facilities ranging from a variety of formats, recording of data electronically, providing summaries and coding of the data and a variety of formats to download the data. The surveys used in the current study were created using 'Google Forms'. The survey link on google forms was sent to members on social media, who in turn responded or completed the survey online. Google Forms have been used in several studies such as course evaluation (Gehring, 2010), or managing grades and attendance (Masor, 2012). The questions asked were aimed at addressing the research questions. Elaboration and clarification probes were used through the open-ended questions in order to elicit additional information and to ensure an understanding was ascertained (Hutchinson & Wilson, 1992). Probing allowed for further exploration of sensitive issues (Nay-Brock, 1984) and to add in any additional information (Gordon, 1975).

3.4. Data Analysis Strategy

There was a mixture of numerical descriptive data alongside the non-numerical data obtained from the results; however, this descriptive data was not statistically analysed. This was due to this area having little / no previous research and hence thematic analysis was selected in order

to create a comprehensive overview of the emergent themes (Smith & Sparkes, 2013). A bottom-up (Lodico et al, 2010) ‘general inductive approach’ as an analysis strategy which is evident in qualitative data analysis (Bryman & Burgess, 1994; Dey, 1993). This allowed for the readings from the raw data to be gathered and codified in order to derive concepts, themes or models based on the researcher’s interpretations (Thomas, 2006). This provided qualitative findings and discussions (Lewis, 2015) which were guided by specific evaluation objectives (Thomas, 2006).

Returned surveys were examined for completeness or haphazard answers (Hartline & Jones, 1996). The transcripts were read several times in order to develop themes and categories, where a coding frame was developed, and the transcripts were coded. Changes were made if new codes emerged from the transcripts and the transcripts were then reread according to the new structure. This process allowed for the development of categories and broad themes based on the discussions (Jain & Ogden, 2002). Participants quotations were documented, where key issues were discussed. Specific codes were given to the key issues and main themes were developed.

3.5. Ethical Considerations

Ethical approval was granted by the University of Salford Ethics Committee before data collection had commenced. Information provided to participants stressed the importance of confidentiality and how all information would be subject to the Data Protection Act 1998. It was also reinforced throughout the stages of the research of the participants right to withdraw at any time, for any reason whatsoever. The anonymity of the facility and participants was protected using coding; which was explained to participants. Consent was given prior to the participant completing the survey. Consent was gained through an explanation and selection allowing the participant to agree before completing the survey.

4. Findings

4.1. Descriptive results

The participants were unknown to the researcher prior to the investigation. Most participants were aged between 18-29 (49.2%) followed by 30-39 (36.9%), 40-49 (10.8%), 50-59 (3.1%),

with males comprising of 60.6% and females 39.4%. There were 5 fitness facilities chains used in the research from Central Manchester where members were contacted through their SMW account and interactions. These facilities were given coded names A, B, C, D, E and F; and the distribution of participants can be seen in Table 1.

Table 1: Distribution of participants from different fitness facilities

Facility (%)					
A	B	C	D	E	F
15.2	12.1	12.1	13.6	43.9	6.1

Facility A was the only facility which was CrossFit based and exclusive to this location. Facilities B, D and E were similar in prices and facilities with the focus being on 24-hour services and low prices. Facility E received the most response from participants (43.9%) which is nearly three times more than the others; however, this is due to the fact there are three branches of this chain fitness facility used in the selected location. Facility C was also low priced, but not 24-hour. Facility F offered prices nearly 4x the amount of the other facilities; however, had additional staff services such as physiotherapists, had a swimming pool and was the only public sector organisation in the study.

The findings are presented through thematic analysis (Smith & Sparkes, 2013). The main themes identified were; *“motivations and reasons for joining fitness facilities, barriers preventing the access and use of the fitness facility and services, IT and technology and support structures.*

4.2. Main Themes Identified

- *Motivations and reasons for joining fitness facilities*

Health reasons were reported by 71.2% of the participants as the motivation for joining their fitness facility:

“I actually have PCOS (Polycystic Ovary Syndrome) so I was told by my doctor to begin a fitness lifestyle.”

“I have type 2 diabetes. Need to lose weight and become healthier.”

“Want to be healthy which means regular exercise (especially through my pregnancy) and want to lose weight.”

“I shattered a ligament in my leg playing roller derby, so the gym has been really helpful for completing all the physio exercises I currently do.”

Participants revealed that part of their medical advice included recommendations to engage in physical activity and therefore took actions to join a fitness facility in order to be physically active. The fitness facility was viewed as conceptual structure, where they believed that they would have the services and support in order to address their health concern and create a lifestyle change to improve their current conditions. The price of the membership was spoken by most participants as being ‘cheap’ and ‘affordable’ and provided the necessary facilities and services in this price range. Participants also revealed that aspects such as student discounts, promotions for referrals, seasonal discounts and flexibility in purchasing additional services all influenced their decision to join their facility. These financial incentives also served as motivation to refer others to the join their facility:

“It’s financially affordable and still offers up-to- date gym equipment and classes with the option to pay for it if wanted.”

“I would refer others, as you get discounts for doing this.”

“My budget is limited plus work schedule very hectic.”

“I pay so I can use all pure gym in country which is great as I travel with work.”

“Open 24 hours, clean changing rooms with good privacy”

- ***Barriers preventing the access and use of the fitness facility and services***

The most reported barrier was ‘injury’ (70.2%), followed by the ‘lack of knowledge or information about exercise’ (35.1%) and ‘illness’ (28.1%). Other barriers were reported by 10% or less of the sample group. The distribution between facilities were proportionate to each other with no one facility providing more injury reports than the other. The barriers identified appeared to exist prior to joining the facility as well as during the use of the facility services:

“When I was pregnant there wasn’t many options for pregnant women, especially working ones. When I injured myself, I had to take a break and recover and when I started, I had no idea what to do at the gym.”

“When I first joined the gym, I had zero knowledge on what to do or even how to do it. I was shy and there weren’t many woman trainers at the gym at the time I would go, and I was shy to speak to male trainers.”

Participants revealed that barriers such as the lack of information not only affected them when initially joining the facility but also during their time as a member, where they were unable to progress or address their changing needs. The lack of information was also linked to the formation of secondary barriers such as injury, which was reported to occur as a result of not having sufficient knowledge about physical activity and would overdo exercises, perform the wrong type of training or not sufficiently maintain nutritional needs required for specific training. Participants revealed several negative consequences of experiencing barriers during their pursuit of physical health:

“Shattered my ACL (Anterior Cruciate Ligament) which has completely changed my training at the moment to be honest as previously my exercises were all intense leg/core for roller-derby, and I can’t do that anymore as have to follow physio guidelines.”

I am currently injured and finding it very frustrating that I’m unable to train as I would like. One of my reasons for looking for a PT is to ensure I rehab my injury safely and sensibly. At the same time maximising and pushing limits on what I am able to do.”

The majority of the participants reported that they were not able to continue physical activity or would require a change in their sessions and type of activity they were previously doing. Some had mentioned the pursuit of information or additional support in order to make these changes. The impact on the fitness facility was linked to the impact on the participants physical health. The reports of not being able to exercise also adversely effected the facility as this prevented participants from attending their facility, or not attending as often as they did:

“Not much support really, hence why I keep leaving and when I’m better I go back.”

“Illness and injury would prevent me from training for a short period of time.”

“I returned to the gym when I felt able to do so.”

There were differences seen between facilities in this aspect due to the availability of medical personnel on premises, where others sought external advice:

“Physiotherapist to help me recover with specific exercises.”

“I sought advice from my GP (General Practitioner) who agreed that regular exercise should help my depression.”

“Doctors generally just tell me to leave the workouts and walk more.”

“I went to my GP who downloaded some exercises for me to do with my shoulder. It didn’t really help much.”

One of the facilities offered physiotherapist services as part of their facility, where participants reported that they were able to access if they had any injury. These participants appeared to have a more positive experience during their identified barrier, which was injury, as they were provided with the additional information and support which was required during these conditions. Participants from other facilities revealed that they had received external medical advice from either a GP or physiotherapist who had given guidelines on what was to be avoided but didn't receive clear instruction on what specifically could be performed in their facility. Finding the correct advice was described as 'difficult' and 'tricky' and therefore problematic when attempting to continue with physical activity when experiencing a barrier. This will be discussed in more detail later in the support, guidance and advice section.

- ***Information Technology***

There were differences seen between facilities in terms of what was provided as well as what was expected by the participants by the facilities. Overall, only 38.6% of the participants mentioned IT as a support structure available in their facility. Facility A and E participants mentioned the facility social media and B and E had mentions of using the facility app to book classes online:

“Book classes through my app but PTs are independent of the gym itself, so all support related to my PT I don't count as being from the facility itself so other than the app to book classes that's it they do discounts on it and stuff but never anything useful.”

Facility E also had several references made regarding their website and interactions:

“They have an interactive website where I have a personal account. They send me motivational messages when I have been to the gym 5 times or more in a month.”

Participants who were members of facility A, which is a CrossFit facility, appeared to have responses favouring minimal IT within the facility. This appeared to also influence their choice of facility and hence expectations of what the facility provided in their services. There was, however, other participants from facility A who revealed a reliance on the online community:

“The tech there is pretty basic. You don't choose CrossFit if you want a nice and warm facility with mirrors, cross trainers and minimal sweat.”

“CrossFit is very technical and there are very few good instructors locally, so I rely on the online community.”

There were therefore differences in views between facility members as well as within an individual facility itself and how the members viewed IT.

When asked what IT their fitness facility could provide to help support their training, several suggestions were made from general monitors to specific monitors such as 'My Zone' belts. There were suggestions to have connectivity between facility devices and mobile phones and information in another language. The most commonly reported suggestion was interest from several members on an addition on an app for several reasons:

“Workout app would be good or an online version of a personal trainer that provided like weekly / monthly exercise programs to follow would be awesome.”

“There is a digital platform for CrossFit affiliates, where all members log their workouts and it displays your progress over time. If they invested in that, it would be a significant advantage.”

Other participants criticised the current available technology in their fitness facility:

“In the facility itself I think there are two touchscreens in the hallway not the main gym. I think you can book classes on, but I have never seen anyone use them ever and I'm not sure what you can do with them. Better publicising that maybe good or moving them in the gym.”

“I don't think they promote their online facilities and presence well at all. They will promote their fitness partners like protein shake people and there is a wall about PTs with their numbers etc on but when u join online as I did nothing is sent to u about how to use the online app make the most of it developments etc.”

The consensus was that there appeared to be IT available in their facilities, but no effort was being made in sufficiently promoting it or encouraging members to utilise it for their needs.

When discussing personal IT (apps / monitors / online) in their normal exercise routines; 54.2% used applications (health / fitness / nutrition), 37.3% used monitors (HR monitors / pedometers / other) and 59.3% used online (websites / tutorials / social media). Participants were asked to explain what they use and why:

“I use apps to track my personal bests. I use an Apple Watch to track my activity. I also use social media to get tips on workouts.”

“Social media for planning and information sharing and support amongst group members.”

The most used form of technology appeared to be applications, the most frequent mentioned application was My Fitness Pal (22%). Monitors mentioned were Fitbit (14.8%) and Apple watches (5.5%). Online use ranged from social media such as YouTube and Instagram which

appeared to provide the most guidance for advice, tips and motivation. The majority of the participants did not use any personal IT support during their barrier identified, however it was described as a valuable asset to those who did engage in accessing these sources of support:

“I use online eating disorder chat rooms etc when I relapse occasionally.”

“I would say using YouTube / Instagram has helped me when I first joined the gym because I had zero knowledge on what to do.”

“I used my Fitbit to count steps and calories for when I couldn’t get to the gym as I sometimes have limited mobility so gentle walking is all I can manage.”

“I do use my hr monitor to track if it goes to high as I sometimes faint if it does.”

IT support were described as a way of accessing additional information and providing ideas and guidance. It was also a social connection in providing support and motivation. The monitors appeared to provide a tracking and monitoring role in their regimens in order to control their activity levels and ensure they were performing within safe parameters based on their needs. Conversely, the lack of IT in participants training was described as a positive aspect of their training:

“Minimal technology. It’s refreshing.”

“There is always room for improvement in any industry, but I do feel over reliance on technology could prove counterproductive in some instances. I do also think that with many exercises there is no substitute for a proper demonstration and instruction to ensure safe performance and reduce the risk of injury.”

Both comments were from members at Facility A, a CrossFit facility. There were no participants from other facilities who shared the views of favouring minimal IT and technological integration.

- ***Support structures***

Support appeared to be predominantly in the form of staff such as floor staff, personal trainers and instructors; where 59% of the participants selected this as the facility support provided. The price of memberships appeared to play a significant influence on participant expectations of support provided by their fitness facility:

“There isn’t much support but its expected due to the low price and high volume of clients.”

“I would expect to pay for specific help.”

Participants revealed how low levels of support was acceptable due to the nature of the facility and expressed how they would expect to pay for any additional services or support required. There were differences seen between facilities in this aspect:

“Upon joining there is 3 personal sessions with a coach to work through the fundamentals of Olympic lifts and the other aspects of CrossFit. We use the Wodify app which monitors class participants, records performance and provides historical data on PB (Personal Best: highest score or fastest speed), weights and times. There are often classes to gauge personal and peer performance levels plus a strong use of social media to advise of upcoming added sessions for example endurance running, rowing etc.”

“They have an interactive website where I have a personal account. They send me a motivational message when I have been to the gym 5 times or more in a month.”

“Social media with some ideas or special classes.”

“I attend classes and the gym contacts me regarding the frequency of attendance/lack of attendance.”

“I follow the free workout program that’s provided on the website.”

“Some information is provided but also some contradictory information.”

“There’s a BMI machine that also measures bodyfat.”

Some facilities had a more proactive approach to the types of support provided for their members, such as facility A, whose members predominantly did group weight classes and had more staff interaction rather than IT. Participants from other facilities mentioned website information and support systems, but this was mainly concerned with generic programs, marketing and attendance motivation with no options for personalisation, tracking services, or sufficient information. Technology in the form of Boditrax or similar BMI (Body Mass Index: a measure to work out using your height and weight to see if your weight is health) machines were also mentioned in other fitness facilities apart from facility A, but no mention of the application and adjustments of this information with regards to their routines.

The majority of support was in the form of staff and therefore most of the suggestions for support improvement addressed staff to be friendlier, communicate better, build relationships or be available on the floor:

“More involvement from staff, improved timetable changes.”

“I will say to be fair (Facility E) is cheap as they don’t really have any overheads so I’m not sure whether they can do anything but it would be good if my app could be more of a one stop shop built into my fitness pal etc like affinity sponsored links so you could look after your health and track weight loss all in one place.”

“Generally, gym staff could be more friendly and chatty with members and build relationships with them.”

There were however a significant number of participants who referred to an app and features of an app which would be able to address their needs. This has been addressed in the previous section (IT and technology). It is however important to note that once again, the financial expectations associated with the facility influenced the suggestions for improvements:

Participants expressed that they did not feel personal trainers (PTs) were a service from their facility but were considered a separate mechanism. PTs use was predominantly described in a positive manner:

“Injury stopped me initially using all equipment, but a personal trainer helped me to get through this.”

“I found it beneficial, educational and key to help me to achieve my goals.”

They appeared to be utilised by participants who required additional support, either to address their barriers or to help them achieve their goals. Participants appeared to have long-term relationships with their PTs, which in hand would benefit the fitness facility who too, would gain from a long-term member:

“Have used a PT for almost 3 years now, they have been a massive help in me losing weight and keeping me on track.”

“I’ve been with my current PT for 3 years and could not have achieved even half of what I have without him.”

“My PT moved so I moved with her.”

The support and personalised care participants explained as the benefits of utilising PT services. These relationships seemed more important than facility choice, as one member explained how they changed facility when their PT moved to a new facility; following them to their new facility. There were however also conflicting views in the experiences with PT services:

“It took me a while to find the right one as previous trainer didn’t motivate me enough or seem to care about my goals. They would just set me exercises to what I believed was a standard routine they dice out to clients.”

“I injured my knee training under a personal trainer. Too much cardio combined with poor nutritional advice (insufficient calories) led to me not being able to recover between workouts.”

“The majority were positive; however, several participants did express feelings of disappointment and a waste of money and time. There was overall a general consensus that PTs differed in the quality of services provided, knowledge and professionalism.”

5. Discussion

The current research has revealed a link between a members’ motivation to join facilities and barriers faced during membership; in the form of underlying health concerns. Illness and injury were quoted by 48% of the participants barriers in the study by Toscos et al (2010), like this research being quoted by 49% (illness 28.1% and injury 70.2%); even though this barrier is identified as a principle barrier in the literature. Many cases reveal that people who had injury or illness wanted to be physically active but lacked the knowledge of what was appropriate to do in their current conditions (Bickmore et al, 2005); an aspect described by participants in the current research. Health conditions influence members to seek a facility to engage in physical activity to address their health concern; which is strongly related to HBM (Murray & McMillan, 1993). Participants also revealed how these same health concerns serve as barriers preventing them from engaging in the physical activity they strive to do. This therefore serves as an unconstructive pathway for people who are joining a fitness facility in the hope to address their barriers. TTM was used to explain the phases of change that members face. The lack of knowledge reported by the participants, likewise, played an influence in the initial phases of membership as well as experienced throughout their training and even more-so when they were suffering from an identified barrier. The financial reasons identified by the participants may also serve as a factor during the contemplation phase of the TTM, when a person is considering taking action and is weighing up the pros and cons of their decisions. Key elements of HBT have been summarised and suggestions of integration based on HBT have been made in Table 2.

Table 2. Summary of the key aspects derived from HBT

Theory	Key aspects identified from the theory
HBM	<ul style="list-style-type: none"> • Health concerns identified prior to joining the facility act as motivation to join the facility. • Health concerns experienced during the participants membership act as motivation to address their concern.

	<ul style="list-style-type: none"> • Negative health consequences of not returning to the fitness facility (following the lack of attendance due to their experienced health concerns) serve as a motivation to return to the facility.
TPB	<ul style="list-style-type: none"> • Referrals made by friends and family act as positive behaviour motivation to join the fitness facility as a prospect of social bonding. • When members experience health concerns which prevent them from accessing the facility, social support can influence positive behaviours again. • The view of health and fitness being separate entities as the social norm; not seen as related to each other.
TTM	<ul style="list-style-type: none"> • Precontemplation phase occurs when the member is experiencing their health condition but unaware or uninformed of the consequences of their current behaviours and condition. • Contemplation phase occurs prior to joining a facility when members seek medical advice regarding their health concerns and weigh pros and cons of their current behaviours. • Contemplation phase occurs when financial, referral and reputation are being considered prior to joining the facility. • Contemplation phase occurs when members are faced with health concerns during their membership and they seek support and information on what action to take. • Contemplation phase occurs when members weigh up the pros and cons of returning to the facility following the lack of attendance due to their experienced health concern. • Action phase occurs prior to joining the facility when members take action to join the facility in order to address their health concerns. • Action phase occurs when members utilise sources of information and structures of support.

Key: HBM: Health belief model; TPB: Theory of planned behaviour; TTM: Transtheoretical model

Even though the majority of participants experienced barriers which required additional support, they expressed that financial incentives were a prime factor for selecting their specific facility, which is similar in other findings (Richter et al, 2002; Wilcox et al, 2005; Mathews et al, 2010; Schoenborn et al, 2013; Mauro et al, 2008; Guerin et al, 2003; Evenson et al, 2009) and were more importantly were accepting of the poor levels of support made available in that price range. It is possible that members underestimate the level of support required of the fitness facility in order to address their health concerns and therefore are not making well-informed decisions when selecting their facility. Once they are members of a facility and their health needs become evident; they then realise the additional support required comes at a cost and are unable to access the sufficient support and personalised information to address their health concerns. Regardless of the health condition; when it does occur, the frequency of attending the facility has been reported to decrease. This decrease in frequency is linked to a loss in habit formation and customer retention (de Oliveira, 2018).

IT provided by the facilities varied in terms of what was provided (applications, monitors, online) and how efficient and helpful these provisions were to their support needs. There was a contrast in opinions on what was expected in facilities, where the CrossFit facility members appeared to favour minimal technology. It appears their reliance on physical staff support is related to the nature of their facility and practices even though these facilities are related to high levels of injury identified in the literature. CrossFit injury rates were found to be 20% by Weisenthal et al (2014). Gray and Finch (2015) found overexertion the most common cause of injury and the main cause of injuries occurred in the free weight activities (52%); the main type of exercise used in these practices. This was also identified by research from authors Arning and Ziefle (2009) who found differences in acceptance of eHealth technologies and information and communication technology, despite the enormous potential to improve healthcare services. This therefore signifies that before IT integration occurs, special considerations should be given to the nature of the facility and members; further highlighting the need to acknowledge cultural and environmental factors when attempting to influence the needs of users through technology (Ahtinen et al, 2008).

Some participants made several suggestions for improvements mainly in the form of apps and digital platforms providing a more personalised service. Others criticised the facility for the current IT that was available but not utilised efficiently by members due to the lack of efforts by the facility to make members aware or poor management of online presence creation. Brynjolfsson and Brown (2005) researched 1167 firms over 10 years and drew several conclusions as well as stating that if IT is invested in, but digital organisation practices are not adopted, money spent on IT would provide little return. This is evident from our findings.

Personal use of IT predominantly took the form of apps and online sources with over half the participants utilising these platforms and a third of participants utilising monitors. This demonstrated familiarity of these elements and the significant role they play in their fitness routines. However, despite this familiarity, there was a poor response to these being used during their experienced barrier; possibly due to the nature of the barriers. The barriers were predominantly health related and hence medical advice was sought rather than fitness IT. This could be because participants were mainly provided with staff support in their facilities. The concept of seeking IT support may have been unfamiliar, especially in the medical sense; as this is a fairly new concept with digital platforms such as Push Doctor only gaining momentum in 2016/2017 (Begum, 2016).

Financial elements were brought to light again in the topic of support, as the support was associated to the price of memberships. An acceptance of poor levels of support prevailed amongst participants as they felt it was justified by the facility based on their low-cost membership price. The main form of support identified came in the form of staff support, with little to no reliance on IT from the facility in their current training practices or when during their identified barrier conditions. Despite the dominance of personal IT use, it appears little to no support was provided in these platforms. The platforms that did exist in the facilities such as the apps, websites and social media pages were criticised for improvements by the participants, as well as being criticised for the lack of awareness of these services. The reliance and use of PT's was inevitable due to the other support structures presenting such poor alternatives. This however did not satisfy the initial motives for joining facilities which were predominantly financially driven, as this support structure required additional financial commitments. This form of support was also criticised for being contradictory and motivational instead of being informative and sufficient to cater for their additional needs, which corresponds to views expressed in previous studies (Levins et al, 2004; Letts et al, 2011; Kehn & Kroll, 2009).

6. Conclusion

This research has revealed the motivations and reasons for joining a fitness facility are predominantly health related and therefore facilities should provide support structures which can sufficiently support the needs associated with these motives. Alongside these efforts, the financial commitments that these support structures present should not be of such a high nature, that it would negatively affect their financial views. Currently, members join with the hope to address their health concern, find limited support and are unable to pursue physical activity in the facility. Others are faced with health concerns during their membership and are negatively impacted by the changes to their routines and lack of support and coping mechanisms. Both pathways lead to negative consequences for a fitness facility due to the decreased frequency in attending the facility which is associated to declines in retention.

The research also revealed a lack of IT support in current fitness facility practices, despite the popular use of personal IT by members in their facility as support mechanisms. IT integration could serve as a tool to address barriers which are not currently being met by fitness facilities in order to enhance the relationship between fitness facilities and members. By combining the

ability of the fitness facility to respond directly to the needs of their members while providing a highly interactive, customised experience; the facility will have a greater ability to establish, nurture and sustain customer relationships for the long-term (Winer, 2001). The addition of IT as a support mechanism should however consider the individual nature of each fitness facility environment and to take into account the individual preferences and expectations of the members. The suggestions of an IT support integration on a digital platform, provides organisations and future researchers with a concept which can help guide strategies and adapt practical approaches.

The concept of digital support for health conditions is fairly new and therefore the suggestion of digital support for health conditions provided by a fitness facility appears to be unknown by members. Health and fitness appear to be viewed as separate entities as does support and digital support. These elements therefore require practical development and testing amongst members in order to define the parameters to which they are able to provide adequate support. Firstly, it is recommended that future research involves a development of an IT integration strategy through the development of a digital platform. The key digital tools required for this platform would need to be identified and applied to members in a fitness facility for a period of time and during an identified health condition. Secondly, future research should also involve investigating the integration of medical support as a fitness facility structure due to the significant number of members who have health conditions. This will provide the quality and expertise required in the digital platforms mentioned above. Health and fitness should no longer be viewed as separate ventures, but collaborative efforts should be made in both these aspects in order to provide a service which is personalised, relevant and adaptable to the ongoing changes members face in their health and fitness needs. Lastly, members who are not on SMW should be explored in the same manner to gain further insight to the current papers results.

A number of limitations were encountered during this research. The most significant being the nature of the data gathering tool. Responses from participants were sometimes vague even though the questions were open ended. While a survey was a useful tool to gain a larger sample size; a semi-structured interview would have resulted in richer information regarding their experiences and needs. The research was time limited. Although the aims and research questions were met with regards to exploring member experiences; conducting additional research into identifying the digital tools required by those with health conditions and assessing the effectiveness of an IT integration in a fitness facility would make a significant difference to the academic rigor of this thesis. The sample selection was also limited to only members

who were using a SMW and interacted with their fitness facility. Further research into members who were not on SMW could possibly reveal additional elements not covered by this paper.

7. References

- Ahtinen, A., Isomursu, M., Mukhtar, M., Mäntyjärvi, J., Häkkinen, J., & Blom, J. (2009). Designing social features for mobile and ubiquitous wellness applications. In Proceedings of the 8th international Conference on Mobile and Ubiquitous Multimedia (p. 12). ACM.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Albinali, F., Intille, S., Haskell, W., & Rosenberger, M. (2010). Using wearable activity type detection to improve physical activity energy expenditure estimation. In Proceedings of the 12th ACM international conference on Ubiquitous computing (pp. 311-320). ACM.
- Alessi, E. J., & Martin, J. I. (2010). Conducting an internet-based survey: Benefits, pitfalls, and lessons learned. *Social Work Research*, 34(2), 122-128.
- Andrews, D., Nonnecke, B., & Preece, J. (2003). Electronic survey methodology: A case study in reaching hard-to-involve Internet users. *International journal of human-computer interaction*, 16(2), 185-210.
- Ang, L., & Buttle, F. (2006). Customer retention management processes: A quantitative study. *European journal of marketing*, 40(1/2), 83-99.
- Annesi, J. J. (2001). Effects of music, television, and a combination entertainment system on distraction, exercise adherence, and physical output in adults. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 33(3), 193.
- Armitage, C. J. (2005). Can the theory of planned behavior predict the maintenance of physical activity? *Health psychology*, 24(3), 235.
- Arning K., Ziefle M. (2009) Different Perspectives on Technology Acceptance: The Role of Technology Type and Age. In: Holzinger A., Miesenberger K. (eds) HCI and Usability for e-Inclusion. USAB 2009. Lecture Notes in Computer Science, vol 5889. Springer, Berlin, Heidelberg
- Bardram, J. E. (1997). Plans as situated action: an activity theory approach to work-flow systems. In Proceedings of the Fifth European Conference on Computer Supported Cooperative Work (pp. 17-32). Springer, Dordrecht.
- Begum, S. (2016). Rebrand for Push Doctor as it introduces new services. Manchester Evening News. Retrieved from <https://www.manchestereveningnews.co.uk/business/business-news/rebrand-push-doctor-introduce-s-new-11938222>
- Benkel, I., Wijk, H., & Molander, U. (2009). Family and friends provide most social support for the bereaved. *Palliative medicine*, 23(2), 141-149.

- Bickmore, T. W., Caruso, L., & Clough-Gorr, K. (2005, April). Acceptance and usability of a relational agent interface by urban older adults. In CHI'05 extended abstracts on Human factors in computing systems (pp. 1212-1215). ACM.
- Blythe, M., & Monk, A. (2002). Notes towards an ethnography of domestic technology. In Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques (pp. 277- 281). ACM.
- Bopp, M., Lattimore, D., Wilcox, S., Laken, M., McClorin, L., Swinton, R., & Bryant, D. (2006). Understanding physical activity participation in members of an African American church: a qualitative study. *Health education research*, 22(6), 815- 826.
- Boseley, S. (2018). Obesity putting strain on NHS as weight-related admissions rise. The Guardian. Retrieved from <https://www.theguardian.com/society/2018/apr/04/obesity-putting-strain-on-nhs-as-weight-related-admissions-rise>
- Brazeau, A. S., Rabasa-Lhoret, R., Strychar, I., & Mircescu, H. (2008). Barriers to physical activity among patients with type 1 diabetes. *Diabetes care*, 31(11), 2108-2109.
- Brynjolfsson, E., & Brown, P. (2005). Vii pillars of IT productivity. *Optimize*, 4(5), 26-35.
- Burns, N. (2004). Negotiating difference: disabled people's experiences of house-builders. *Housing Studies*, 19(5), 765-780.
- Buttussi, F., ChITaro, L., & Nadalutti, D. (2006). Bringing mobile guides and fitness activities together: a solution based on an embodied virtual trainer. In Proceedings of the 8th conference on Human-computer interaction with mobile devices and services (pp. 29-36). ACM.
- Chew C, Eysenbach G. (2010). Pandemics in the age of Twitter: content analysis of Tweets during the 2009 H1N1 outbreak. *PLoS One* 2010; 5:e14118.
- Chimen, M., Kennedy, A., Nirantharakumar, K., Pang, T. T., Andrews, R., & Narendran, P. (2012). What are the health benefits of physical activity in type 1 diabetes mellitus? A literature review. *Diabetology*, 55(3), 542- 551.
- Conroy, D. E., Yang, C. H., & Maher, J.P. (2014). Behavior change techniques in top-ranked mobile apps for physical activity. *American journal of preventive medicine*, 46(6), 649-652.
- Crawford, S., McCabe, S. E., & Pope, D. (2005). Applying web-based survey design standards. *Journal of Prevention & Intervention in the Community*, 29(1-2), 43-66.
- de Oliveira, M. F. B. (2018). Gym Retention Strategies-Study of Habit Formation.
- Dillman, D. A., & Smyth, J. D. (2007). Design effects in the transition to web-based surveys. *American journal of preventive medicine*, 32(5), S90-S96.
- Dergance, J. M., Calmbach, W. L., Dhanda, R., Miles, T. P., Hazuda, H. P., & Mouton, C.P. (2003). Barriers to and benefits of leisure time physical activity in the elderly: differences across cultures. *Journal of the American Geriatrics Society*, 51(6), 863-868.

- Evenson, K. R., Moos, M. K., Carrier, K., & Siega-Riz, A. M. (2009). Perceived barriers to physical activity among pregnant women. *Maternal and child health journal*, 13(3), 364.
- Fan, W., & Yan, Z. (2010). Factors affecting response rates of the web survey: A systematic review. *Computers in human behavior*, 26(2), 132-139.
- Freedson, P., Bowles, H. R., Troiano, R., & Haskell, W. (2012). Assessment of physical activity using wearable monitors: recommendations for monitor calibration and use in the field. *Medicine and science in sports and exercise*, 44(1 Suppl 1), S1.
- Frimming, R. E., Polsgrove, M. J., & Bower, G. G. (2011). Evaluation of a health and fitness social media experience. *American Journal of Health Education*, 42(4), 222-227.
- Gallant, M. P., & Dorn, G. P. (2001). Gender and race differences in the predictors of daily health practices among older adults. *Health Education Research*, 16(1), 21-31.
- Gebhardt, W. A., & Maes, S. (2001). Integrating social-psychological frameworks for health behavior research. *American Journal of Health Behavior*, 25(6), 528-536.
- Gehringer, E. F. (2010). Daily course evaluation with Google forms. In ASEE, American Society for Engineering Education Annual Conference & Exposition (Vol. 27).
- GITleson, K. (2013). BBC News - Can Nike's Fuelband really motivate you to exercise? 2013. <http://www.bbc.co.uk/news/technology-24543910>
- Given, L. M. (Ed.). (2008). *The Sage encyclopaedia of qualitative research methods*. Sage Publications.
- Goncalves, C., Correia, A., & Diniz, A. (2012). Internal and external variables to the individual influencing the behavior of re- training members in fitness/Variaveis internas e externas ao individuo que influenciam o comportamento de retencao de socios no fitness/Variáveis internas y externas para el individuo a influir en el comportamiento de los miembros de retencion en la aptitud. *Podium: Sport, Leisure and Tourism Review*, 1(2), 27-61.
- Gordon, R. L. (1975). *Interviewing: Strategy, Techniques, and Tactics*, Chicago, Ill.
- Granger, B. B., Sandelowski, M., Tahshjain, H., Swedberg, K., & Ekman, I. (2009). A qualitative descriptive study of the work of adherence to a chronic heart failure regimen: patient and physician perspectives. *Journal of Cardiovascular Nursing*, 24(4), 308-315.
- Gray, S. E., & Finch, C. F. (2015). Epidemiology of hospital-treated injuries sustained by fitness participants. *Research quarterly for exercise and sport*, 86(1), 81-87.
- Greaves, C. J., Sheppard, K. E., Abraham, C., Hardeman, W., Roden, M., Evans, P. H., & Schwarz, P. (2011). Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC public health*, 11(1), 119.
- Guerin, P. B., Diriye, R. O., Corrigan, C., & Guerin, B. (2003). Physical activity programs for refugee Somali women: working out in a new country. *Women & Health*, 38(1), 83-99.

- Gupta, N., & Jilla, S. (2011, December). Digital fitness connector: smart wearable system. In 2011 First International Conference on Informatics and Computational Intelligence (pp. 118-121). IEEE.
- Guzman-Castillo, M., Ahmadi-Abhari, S., Bandosz, P., Capewell, S., Steptoe, A., Singh-Manoux, A., ... & O'Flaherty, M. (2017). Forecasted trends in disability and life expectancy in England and Wales up to 2025: a modelling study. *The Lancet Public Health*, 2(7), e307-e313.
- Harrison, M. (2004). Defining housing quality and environment: disability, standards and social factors. *Housing Studies*, 19(5), 691-708.
- Harrison, M., & Davis, C. (2001). Housing, social policy and difference: Disability, ethnicity, gender and housing. *Policy Press*.
- Hartline, M. D., & Jones, K. C. (1996). Employee performance cues in a hotel service environment: Influence on perceived service quality, value, and word-of-mouth intentions. *Journal of business research*, 35(3), 207-215.
- Heavilin N, Gerbert B. (2011). Page JE. et al. Public health surveillance of dental pain via Twitter. *Journal of Dental Research*; 90:1047–1051.
- Hochbaum, G., Rosenstock, I., & Kegels, S. (1952). Health belief model. United States *Public Health Service*.
- Holman, C. D., Donovan, R. J., & Corti, B. (1996). Factors influencing the use of physical activity facilities: results from qualitative research. *Health Promotion Journal of Australia: Official Journal of Australian Association of Health Promotion Professionals*, 6(1), 16.
- Hutchinson, S. A., & Wilson, H. S. (1992). Validity threats in scheduled semi-structured research interviews. *Nursing Research*.
- Jain, A., & Ogden, J. (1999). General practitioners' experiences of patients' complaints: qualitative study. *Bmj*, 318(7198), 1596- 1599.
- Jamieson, D. (1994). Customer retention: Focus or failure. *The TQM Magazine*, 6(5), 11-13.
- Juarbe, T., Turok, X. P., & Pérez-Stable, E.J. (2002). Perceived benefits and barriers to physical activity among older Latina women. *Western journal of nursing research*, 24(8), 868-886.
- Kehn, M., & Kroll, T. (2009). Staying physically active after spinal cord injury: a qualitative exploration of barriers and facilitators to exercise participation. *BMC Public Health*, 9(1), 168.
- Kumanyika, S., Whitt-Glover, M. C., Gary, T. L., Prewitt, T. E., Odoms-Young, A. M., Banks-Wallace, J., ... & Samuel-Hodge, C. D. (2007). Expanding the obesity research paradigm to reach African American communities. *Preventing chronic disease*, 4(4).
- Lascar, N., Kennedy, A., Hancock, B., Jenkins, D., Andrews, R. C., Greenfield, S., & Narendran, P. (2014). Attitudes and barriers to exercise in adults with type 1 diabetes (T1DM) and how best to address them: a qualitative study. *PLoS One*, 9(9), e108019.

- Letts, L., Ginis, K. A. M., Faulkner, G., Colquhoun, H., Levac, D., & Gorczynski, P. (2011). Preferred methods and messengers for delivering physical activity information to people with spinal cord injury: A focus group study. *Rehabilitation psychology, 56*(2), 128.
- Levins, S. M., Redenbach, D. M. (2004). Individual and societal influences on participation in physical activity following spinal cord injury: a qualitative study. *Physical Therapy, 84*(6), 496-509.
- Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health promotion practice, 16*(4), 473-475.
- Lin, J. J., Mamykina, L., Lindtner, S., Delajoux, G., & Strub, H. B. (2006). Fish'n'Steps: Encouraging physical activity with an interactive computer game. In International conference on ubiquitous computing (pp. 261-278). Springer, Berlin, Heidelberg.
- Liu, M., & Wronski, L. (2018). Examining completion rates in web surveys via over 25,000 real-world surveys. *Social Science Computer Review, 36*(1), 116-124.
- Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2010). Methods in educational research: *From theory to practice* (Vol. 28). John Wiley & Sons.
- Mansor, A. Z. (2012). Managing student's grades and attendance records using google forms and google spreadsheets. *Procedia- Social and Behavioral Sciences, 59*, 420-428.
- Mathews, A. E., Laditka, S. B., Laditka, J. N., Wilcox, S., Corwin, S. J., Liu, R., ... & Logsdon, R. G. (2010). Older adults' perceived physical activity enablers and barriers: a multicultural perspective. *Journal of aging and physical activity, 18*(2), 119-140.
- McPeake, J., Bateson, M., & O'Neill, A. (2014). Electronic surveys: how to maximise success. *Nurse researcher, 21*(3).
- Mauro, M., Taylor, V., Wharton, S., & Sharma, A. M. (2008). Barriers to obesity treatment. *European journal of internal medicine, 19*(3), 173-180.
- Mercer, K., Li, M., Giangregorio, L., Burns, C., & Grindrod, K. (2016). Behavior change techniques present in wearable activity trackers: a critical analysis. *JMIR mHealth and uHealth, 4*(2).
- Miles, R., & Panton, L. (2006). The influence of the perceived quality of community environments on low-income women's efforts to walk more. *Journal of Community Health, 31*(5), 379-392.
- Munro, S., Lewin, S., Swart, T., & Volmink, J. (2007). A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS?. *BMC public health, 7*(1), 104.
- Nay-Brock, R. M. (1984). A comparison of the questionnaire and interviewing techniques in the collection of sociological data. *The Australian journal of advanced nursing: a quarterly publication of the Royal Australian Nursing Federation, 2*(1), 14.
- Patel, M., & O'Kane, A. A. (2015). Contextual influences on the use and non-use of digital technology while exercising at the gym. In Proceedings of the 33rd Annual

- ACM Conference on Human Factors in Computing Systems (pp. 2923-2932). ACM.
- Peterson, L. A., Blattberg, R. C., & Wang, P. (1997). Database marketing: Past, present, and future. *Journal of Direct Marketing*, 11(4), 109-125.
- Prochaska, J. J., Pechmann, C., Kim, R., & Leonhardt, J. M. (2012). Twitter= quITer? An analysis of Twitter quit smoking social networks. *Tobacco control*, 21(4), 447-449.
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American journal of health promotion*, 12(1), 38-48.
- Richter, D. L., Wilcox, S., Greaney, M. L., Henderson, K. A., & Ainsworth, B. E. (2002). Environmental, policy, and cultural factors related to physical activity in African American women. *Women & Health*, 36(2), 89-107.
- Rimmer, J. H., Riley, B., Wang, E., Rauworth, A., & Jurkowski, J. (2004). Physical activity participation among persons with disabilities: barriers and facilitators. *American journal of preventive medicine*, 26(5), 419-425
- Rolfe, D. E., Yoshida, K., Renwick, R., & Bailey, C. (2009). Negotiating participation: how women living with disabilities address barriers to exercise. *Health care for women international*, 30(8), 743-766.
- Rooksby, J., Rost, M., Morrison, A., & Chalmers, M. C. (2014, April). Personal tracking as lived informatics. In Proceedings of the 32nd annual ACM conference on *Human factors in computing systems* (pp. 1163- 1172). ACM.
- Sallis, J. F., Floyd, M. F., Rodríguez, D. A., & Saelens, B. E. (2012). Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation*, 125(5), 729-737.
- Schoenborn, C. A., Adams, P. F., & Peregoy, J. A. (2013). Health behaviors of adults: United States, 2008-2010. Vital and health statistics. Series 10, data from the *National Health Survey*, (257), 1-184.
- Schrack, J. A., Cooper, R., Koster, A., Shirota, E. J., Murabito, J. M., Rejeski, W. J., ... & Harris, T. B. (2016). Assessing daily physical activity in older adults: unraveling the complexity of monitors, measures, and methods. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, 71(8), 1039-1048.
- Schrack J, Zipunnikov V, Crainiceanu C. Electronic devices and applications to track physical activity. *JAMA* (2015) 313(20):2079–80. doi:10.1001/jama.2015.3877
- Schuelter-Trevisol, F., H Wolff, F., R Alencastro, P., Grigoletti, S., L Ikeda, M., BM Brandao, A., ... & C Fuchs, S. (2012). Physical activity: do patients infected with HIV practice? How much? A systematic review. *Current HIV research*, 10(6), 487-497.
- Sendi, R., & KERBLER-KEFO, B. (2009). Disabled people and accessibility: How successful is Slovenia in the elimination and prevention of built-environment and communication barriers? *Urbani izziv*, 20(1), 123- 140.
- Schmittlein, D. S. (1996). Customers as strategic assets. *Mastering Management. Part 8. Financial Times*.

- Shankar, P. R., Partha, P., & Shenoy, N. (2002). Self-medication and non-doctor prescription practices in Pokhara valley, Western Nepal: a questionnaire-based study. *BMC family practice*, 3(1), 17.
- Shannon, D. M., & Bradshaw, C. C. (2002). A comparison of response rate, response time, and costs of mail and electronic surveys. *The Journal of Experimental Education*, 70(2), 179-192.
- Sheahan, S. L., & Fields, B. (2008). Sodium dietary restriction, knowledge, beliefs, and decision
- Smith, B., & Sparkes, A. C. (2013). Qualitative research methods in sport, exercise and health: From process to product. Routledge.
- Spruyt, B., & Van Droogenbroeck, F. (2014). Forewarned is forearmed? A survey-experiment concerning the impact of pre-notification letters on response in a postal survey. *Irish Journal of Sociology*, 22(2), 86-95.
- Stroebe, W. (2011). Social psychology and health. *McGraw-Hill Education* (UK).
- Sullivan, A. N., & Lachman, M. E. (2017). Behavior change with fitness technology in sedentary adults: a review of the evidence for increasing physical activity. *Frontiers in public health*, 4, 289.
- Surujlal, J., & Dhurup, M. (2011). Customer Retention Strategies in Commercial Health and Fitness Centers. In International Conference on Advancements in Information Technology (pp. 51-59).
- Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American journal of evaluation*, 27(2), 237-246.
- Toscos, T., Consolvo, S., & McDonald, D. W. (2010, November). is it normal to be this sore?: using an online forum to investigate barriers to physical activity. In Proceedings of the 1st ACM International Health Informatics Symposium (pp. 346-355). ACM.
- Ussher, M., Stanbury, L., Cheeseman, V., & Faulkner, G. (2007). Physical activity preferences and perceived barriers to activity among persons with severe mental illness in the United Kingdom. *Psychiatric services*, 58(3), 405-408.
- Verheijden, M. W., Bakx, J. C., Van Weel, C., Koelen, M. A., & Van Staveren, W. (2005). Role of social support in lifestyle-focused weight management interventions. *European journal of clinical nutrition*, 59(S1), S179.
- Weisenthal, B. M., Beck, C. A., Maloney, M. D., DeHaven, K. E., & Giordano, B.D. (2014). Injury rate and patterns among CrossFit athletes. *Orthopaedic Journal of Sports Medicine*, 2(4), 2325967114531177.
- Welk, G. J., Blair, S. N., Wood, K., Jones, S., & Thompson, R. W. (2000). A comparative evaluation of three accelerometry-based physical activity monitors. *Medicine and science in sports and exercise*, 32(9 Suppl), S489-97.
- Wellman, B. (2004). The three ages of internet studies: ten, five and zero years ago. *New media & society*, 6(1), 123-129.

- Wilcox, S., Castro, C., King, A. C., House-mann, R., & Brownson, R. C. (2000). Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. *Journal of Epidemiology & Community Health*, 54(9), 667-672.
- Winer, R. S. (2001). A framework for customer relationship management. *California management review*, 43(4), 89-105.
- Yardley, L., Choudhury, T., Patrick, K., & Michie, S. (2016). Current issues and future directions for research into digital behavior change interventions. *American journal of preventive medicine*, 51(5), 814-815.