

Supporting Fitness Activity: Final Report

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INTRODUCTION

Motivation and Problem Statement

The Canadian Physical Activity Guideline indicates that adults aged 18 to 64 years, irrespective of gender, cultural background, or socio-economic status, should accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week [1]. However, a 2018 study from Statistics Canada found that only 17 percent of adults are meeting this guideline [2]. That means that 83 percent of the Canadian adult population are not active enough and consequently are not reaping the health benefits of a physically active lifestyle which include improved fitness, strength, and mental health (morale and self-esteem). It also means that they are at greater risk of premature death and developing heart disease, stroke, high blood pressure, certain types of cancer, type 2 diabetes, osteoporosis, and obesity. Efforts have been made to assist people to adopt more active lifestyles.

Wearable fitness trackers (commonly referred to as “wearables”) offer considerable promise for assisting individuals to improve their active lifestyle behaviours. These trackers are typically worn on the wrist and rely on accelerometers to detect the body’s movement and convert it into data. The data are sent to an application (either associated with the wearable or a third-party integration) on a smartphone, tablet, or computer, where software computes the number of steps taken, exercise intensity, distance travelled, or estimated calories burned. Additional features, such as heart rate monitors and altimeters (which measure elevation climbed) are available. Most generate graphs with detailed data and allow you to compare your performance from day to day and week to week [3].

A wide variety of manufacturers and models are in the wearable market, such as Fitbit, Garmin and Apple Watch. Revenue in the wearable market is projected to reach \$287 million (US) in 2021 [4]. However, researchers have found that more than half of individuals who purchased wearables stopped using it and, of these, one-third did so before 6 months had passed [5]. Therefore, investment in wearables does not guarantee that individuals will develop and sustain usage and motivation to maintain a long-term, active lifestyle.

Research by Nyenhuys et al., highlights the importance of using personalized health data on fitness applications. They argue that real-time personalized health data can encourage users to take a more active interest in their own health. In addition, social connections with friends will entice individuals who need social motivation and accountability to exercise [5].

Social collective norms positively impact an individual’s level of fitness activity. In addition, individuals tend to share more of their activity data in a given week when a higher number of friends also share their activity data. Social media is perceived as a positive motivating factor in an individual’s level of activity, likely because of accountability. For example, they see their friends exercising and therefore remember or feel that they, too, must exercise. [6]

Research Question and Related Hypotheses

We know that there are high levels of physical inactivity. On the other hand, we know that the wearable industry is booming despite evidence that indicates the adoption of wearables does not necessarily guarantee a long-term active lifestyle. Some pertinent questions arise: what are the factors that limit adults from maintaining long-term (beyond 6 months) physical habits? How do users’ attitudes towards wearables evolve prior to, during, and potentially after adoption?

People feel that their work and family commitments prevent them from participating in physical activity, and that weight loss and health benefits are not always enough to sustain motivation to exercise. Our hypothesis is that despite limitations that were imposed due to the COVID-19 pandemic, adults still believe that they are responsible and are thus in control of their participation (or lack thereof) in physical activity. We suspect that individuals are finding it more challenging to maintain motivation to adequate physical activity during the current pandemic, but that those with wearables have been more likely to develop or maintain an active lifestyle.

User Group

The user group are adults aged 18-64 years old, as this is the cohort that is defined in the Canadian Physical Activity Guideline. This user group includes people of all genders,

cultural backgrounds, and socioeconomic statuses. Furthermore, this user group is not limited to people who wear or have worn wearables because the impact of our findings is ultimately to put forth design recommendations to enhance products in the existing wearables market or to design new products.

Research Approach

We took an exploratory research approach. With this approach, we focused on the motivational systems, existing practices and processes, contextual knowledge and beliefs, and cognitive models.

The goal of our first study was to gain an understanding of experiences into individuals' lives during this pandemic and their efforts to maintain an active lifestyle. The study utilized the semi-structured interview method to collect data and draw conclusions.

The goal of our second study was to gain an understanding of how the experience of owning and using wearables can be enhanced through stimulating meaningful social interactions. A mixed qualitative and quantitative approach was taken. The insights derived from these findings were used in conjunction with the first study to inform product design guidelines.

STUDY 1

Study Design

Open-ended questions were developed in advance and grouped into three themes:

- Theme 1: Behaviours and attitudes toward fitness activity;
- Theme 2: Experience and attitudes towards wearables; and
- Theme 3: The intersection of fitness activity (Theme 1) and wearables (Theme 2).

Some of the prompting questions include: *"Can you describe your current fitness activity habits?"*, *"Has the pandemic affected your fitness habits?"*, *"Why do you choose to exercise?"*, *"What is your experience using wearables?"*, *"Why do you use wearable fitness products?"*, and *"Has the usage of your wearable fitness product impacted your fitness habits?"*. Additional probing questions were also added as the need occurred during the individual interviews.

A sample of 16 participants was selected for this study. These participants were recruited by word of mouth and via social media platforms. 14 participants were female and 2 participants were male; 15 participants were young adults between the ages of 36 years old and 31 years old; 1 participant was aged 64 years old. All participants were English-speaking, and either currently using, or having formerly used a wearable. Individuals that do not use or

who have never used a wearable were excluded from the study.

The purpose, relevance and format of the study were explained to the participants, and informed consent was obtained for their participation. Upon consent, the participants were requested a convenient time for an interview (either face-to-face, by telephone, or through video calling software such as Zoom and FaceTime). Semi-structured interviews were conducted to explore the experiences of fitness activity during the pandemic and attitude toward wearable devices. The interview duration was 15 minutes. With permission from the participants, the interviews were recorded. Interviews were conducted between January 31 and February 12, 2021.

Study Results

Notes taken during the interview and recordings were shared with fellow researchers. The content analysis method was utilized to identify key themes and their frequency. We took a deductive approach ("top-down") as we began with a hypothesis, gathered data, and then confirmed our findings. Prior to analysis, we identified the following set of themes: behaviour and attitudes toward fitness; experience and attitudes towards wearables; and impact of wearables on behaviours. Next, units of analysis (e.g. words and sentences) were pulled from our notes and labelled according to the themes. Examination of these data within each theme was conducted to identify patterns. Finally, specific quotations were pulled from the recordings to support the identified patterns.

Theme 1: Behaviour and Attitudes Towards Fitness

Pattern 1: Physical Health

The study shows that maintaining physical health is one of the primary reasons individuals choose to exercise. 14 out of 16 participants highlighted the correlation between staying healthy and being active. The physical health aspect appeared as the most consistent pattern when analyzing the data from our primary research. It was also mentioned by participants who belong to different age groups. For instance, 26 years old P3 said, "I choose to exercise most importantly to stay healthy" and 64 years old P6 mentioned why she chooses to exercise "...because it's good for my health, and as I've gotten older I've had more health issues".

Pattern 2: Mental Health

Participants mentioned that they value active life not only because of physical health benefits but also because it supports their mental health, mood and overall well-being. 8 out of 16 participants mentioned how exercising helps them as human beings to find peace and to feel good. The study also shed light on how participants' view of exercising has evolved over time. The shift from seeing exercising only as a physical activity towards understanding the mental and spiritual aspects was mentioned a number of

times, “I want to not just strengthen myself physically, but also mentally, spiritually, and emotionally” [P4]. This shift also affected how they see their body, “What motivates me are my own mental state and my body. I truly believe that my body is my temple” [P3].

Pattern 3: Social Aspect

The study shows that the social aspect of exercising is one of the main motivators that help individuals develop long-term fitness habits. 11 out of 16 participants mentioned how being social and sharing fitness experiences with others encourages them to work out more, especially in the long term, “To me exercising is a powerful communal experience, and I really value that” [P12].

Pattern 4: Competition

The study findings were somewhat surprising in regards to the competition aspect of exercising. Prior to the study, our assumption was that competition plays a big role in maintaining fitness habits. However, only 3 out of 16 participants mentioned competition as a motivator while 5 participants spoke negatively and 8 did not mention it at all. Even those who first started exercising for competitive reasons mentioned how they realized the competition does not affect them in a positive way. The study findings made us understand that creating a competitive sentiment around exercising might actually have negative outcomes, “Social sharing is very important, but I actually think competition just makes me feel worse” [P14].

Pattern 5: Challenges

Participants mentioned various challenges to exercising, especially within the context of a global pandemic. Due to the lockdown conditions, 14 out of 16 participants saw the gym/fitness class closures as a major barrier, while 9 participants mentioned how the current stressful times created a challenge to find motivation for exercising. In addition, 11 participants mentioned their busy schedules affected by work and/or school as a general barrier. While participants acknowledge these challenges, 11 out of 16 of them are still able to meet the recommended physical activity per week. Turning these challenges into motivation was also mentioned a number of times. For instance, participants found more time to exercise during the pandemic as they started to exercise at home without needing to commute to a gym or a fitness class. The study made us understand that participants who were already active were able to adapt to the new situation and find new ways to exercise. Therefore, challenges are not direct indicators for not exercising, “With the pandemic, I felt like I was stuck indoors and I could not move. I felt like I needed to be more active to be healthier. So my motivation and my aspect grew larger with the pandemic” [P3].

Theme 2: Experience and Attitudes Towards Wearables

Pattern 1: Fitness Insights

The ability to view health and fitness insights from the wearable tracking mechanisms was highlighted by 10 out of 16 participants as being an important aspect to the use of their wearable. Of note, this was mentioned in the context of feeling incentivized to do more exercise by multiple participants, “If I noticed my data does not achieve the average level, I would do more exercise to catch up” [P8].

Pattern 2: Incentives

The desire for workout incentives on wearables that extend beyond basic health benefits was mentioned a number of times by participants, with 10 out of 16 mentioning the use of gamification such as badges, likes, goals, or rewards among other features, “When I get that ‘you did great today’ achievement badge, I feel really good,” [P3]. 7 out of 16 participants mentioned the need for social sharing. Social sharing in the context of the pandemic was noted to be important by a couple of participants as it allows them to be more social and connect with others during a time of isolation, “...sharing what you accomplished and mutual exchange, it’s a way to connect with people, interaction” [P12].

Pattern 3: Hardware Design

Although our research didn’t focus on the aesthetics or feel of the wearables, this theme came up during interviews multiple times by participants. In regards to aesthetics, 3 spoke positively on the look of their wearables while 4 spoke negatively. On the feel of their wearables, only 1 spoke positively while 7 spoke negatively. Regardless of whether or not the look and feel of the wearables were found to be positive or negative, it’s clear that the hardware is an important aspect for users of these devices considering many brought these up unprompted. One participant enjoyed their wearable but found the band to be a hindrance, “...Fitbit band also caused a rash, so I had to buy a new band” [P6].

Theme 3: Impact of Wearables on Behaviour

Pattern 1: Accountability

8 out of 11 participants have a positive attitude toward accountability. Based on the interview, the most attractive and useful function of wearing a fitness tracker on the wrist is collecting and storing the fitness data. The data translated into the corresponding application will then be utilized by the users to check whether they have accomplished the goal. For example, some interviewees mentioned that “When feeling sedentary, I check to see averages and ensure meeting targets” [P1] and “With the FitBit, absolutely - I like that it will tell me if I’m close to making a certain number of steps in an hour, will do those steps to accomplish the goal” [P6].

Pattern 2: Motivate

11 out of 16 participants said the wearable fitness tracker motivates them to do physical activities in order to achieve the goal. According to “I feel like I strive more to complete goals today” [P13] and “When I get that you did great today's achievement badge, I feel really good” [P3]. The way of setting goals or getting a badge can not only motivate users to exercise but also enable them to develop good exercise habits.

Pattern 3: No Impact

4 out of 16 participants said the wearable fitness tracker has no impact on them. For example, “...it's just a tool. I decide whether to exercise or not, and I always don't want to exercise,” [P16] and “...since I already found a balance that works for me and I was already exercising more than the recommended amount, so it was not encouraging in any way” [P11]. From analyzing the four participants who feel negative about their trackers, we found that participants who do not like exercising or who have already developed strong fitness habits feel the wearable fitness trackers are useless.

Pattern 4: Length of Use

From the records, we noticed that no matter how long they use the tracker, basically, all users wear the tracker every day. And 12 of the 16 participants responded that they had used the tracker for more than 7 months. Analyzing the qualitative data of these 12 participants, we realized that the trackers' feature could help motivate participants to use the tracker for a long time. Most of the participants who use the tracker for a long time are attracted by a specific functionality of the tracker. For example, “I've had varying FitBits the slim ones for about five or six years now. I bought it originally to count steps and to see how much I was walking. I also like the sleep function.” [P14] and “Have had an Apple Watch for over a year. I like the reminders/prompts.” [P9]

Conclusion

The goal of Study 1 was to discover the factors that limit adults from maintaining long-term (beyond 6 months) fitness habits; users' changing attitudes towards wearables prior to, during, and potentially after adoption; and the impact on pandemic on adults' fitness activity who currently use or have used wearables.

After conducting 16 semi-structured interviews we analyzed the data and found that adults participate in fitness activities for mental health and physical health reasons; however, work, school, and stressful circumstances add challenges to maintaining an active lifestyle. In addition, due to the pandemic, and closure of gyms and fitness classes, participants' motivation has decreased. As a result, most of the participants' daily fitness activities were impacted. In addition, most participants attributed socialization as a reason to participate in fitness activities, but they did not describe how to reap the "social" benefit of fitness activity

through their devices. Instead, they noted the look of the wearables, data insights function, and gamification elements influence their daily fitness habit.

STUDY 2

Study Design

Study 2 utilized the questionnaire method to gather both quantitative data and qualitative data. This method was selected given the short time frame. We needed a quick and relatively easy way to get data from a large number of people, in a short amount of time, and at no cost.

The questionnaire included a screener and was followed by 20 closed-ended and open-ended questions. The questionnaire was administered through Google Forms. A link to the questionnaire was distributed on social media channels (e.g., Slack, Discord, and Instagram). The questionnaire was open to respondents from Tuesday, March 2 to March 11, 2021.

41 individuals responded to the study. Individuals that do not use or who have never used a wearable were excluded from the study because they could not share their attitudes, beliefs, feelings, and preferences about owning and using wearables. Also, individuals under the age of 18 and individuals over the age of 64 years were excluded because they fall outside of the “adult” category that is defined in the Canadian Physical Activity Guideline. 4 participants did not meet these criteria and thus were unable to proceed with the questionnaire after the initial screening. Thus, the questionnaire was completed in its entirety by 37 individuals.

29 individuals were female and 8 individuals were male; 17 individuals were between the ages of 25 years old and 34 years old; 7 individuals were between the ages of 18 years old and 24 years old; 2 individuals were between the ages of 35 years old and 44 years old; 1 individual was between the ages of 45 years old and 54 years old. All participants were English-speaking, and either currently using, or having formerly used a wearable.

Study Results

To analyze the qualitative data, each group member individually identified the patterns that emerged from the data through inductive analysis. Then, we brought all of our findings together to find common patterns and discuss some of our disagreements. In order to have a big picture perspective, we clustered relevant patterns together under 3 themes by creating an affinity diagram. Since the questionnaire questions were primarily closed-ended, we supported qualitative analysis by implementing descriptive statistics (mean, median and mode) to explore the deeper meanings behind numeric results.

For analysis of the quantitative data, results were compiled in a spreadsheet to view the frequency and range of the answers, broken down by particular questions. Appropriate

graphs were employed to view the results visually. A high-level analysis per question was conducted to identify the mean, median, mode, and maximum/minimum. Pivot tables were then used to compare answers by demographics to highlight any possible patterns or deviations. These demographics included age and gender identity. A cross-comparison was run to identify positive or negative correlations between individuals' activity levels, their fitness wearables, and particular behaviours including socializing and exercise habits. A deductive approach was employed to identify how social features are used, while an inductive approach was employed to gain a better understanding of the differences in fitness habits between those who exercised more and those who exercised less.

After analyzing the data, we found that most respondents are not meeting the recommended 150 minutes of moderate-to-vigorous intensity physical activity per week as set forth in the Canadian Physical Activity Guidelines. Interestingly, respondents pay the greatest attention to the "step" data, not "active minute" data.

With regards to socialization, respondents who are already achieving the minimum amount of physical activity are likely to exercise on their own, while those who exercise less are just as likely to exercise alone as they are to exercise with an acquaintance. Our findings also show that the desire to share activity data stems from finding motivation, having added accountability, getting support from friends, feeling a sense of pride, and having fun. Most participants who prefer not to share their activity data are concerned with privacy around the sharing of data on social media platforms, believing that data is personal property, and dislike competition. While most respondents attribute social interaction as having some degree of importance, our findings show that social sharing is the least satisfactory feature on their wearables.

In terms of gamification, we found that all apps have space to improve the gamification features. Dissatisfaction and satisfaction levels regarding gamification features were fairly evenly distributed across all wearable brands.

Theme 1: Not Meeting the Recommended Canadian Physical Activity Guidelines

Pattern 1: Attainment of Physical Activity

The Canadian Physical Activity Guideline indicates that adults aged 18 to 64 years, irrespective of gender, cultural background, or socio-economic status, should accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more [1]. Most respondents are not meeting this guideline. Of the 37 responses, 13 individuals indicate that they get 101 to 150 minutes of moderate-to-vigorous intensity physical activity per week; 12 individuals indicate that they get 1 to 50 minutes of moderate-to-vigorous intensity physical activity per week; 8 individuals indicate that they get greater than 150 minutes of moderate-to-vigorous intensity

physical activity per week; 3 individuals indicate that they get 51 to 100 minutes of moderate-to-vigorous intensity physical activity per week, and 1 individual indicates that they get 1 to 50 minutes of moderate-to-vigorous intensity physical activity per week.

The data also suggests that the more individuals spend doing moderate-to-vigorous intensity physical activity, the more likely they are to prefer to exercise by themselves. Of the 8 individuals who report spending greater than 150 minutes of moderate-to-vigorous intensity physical activity per week, 7 prefer to exercise by themselves; of the 13 individuals who report spending between 101 and 150 minutes of moderate-to-vigorous intensity physical activity per week 11 prefer to exercise by themselves; of the 12 individuals who report spending between 1 and 50 minutes of moderate-to-vigorous intensity physical activity per week, only 5 prefer to exercise by themselves.

Pattern 2: Focus on Steps

Humans like numbers. We already know that individuals are drawn to the data that their wearables track, capture and present. From the questionnaires, it is interesting to note that the most preferred element of data that individuals use is the step counter. "Steps" track individual movement, but they are not the measure used in the Canadian Physical Activity Guideline. Data that would inform users how they are measuring against the guidelines would be "active minutes" yet this data point is about 10 percent lower in popularity as compared to "steps". It begs the question, is the app's focus on obtaining 10,000 steps a day trendy and misguided? [7]

Theme 2: Socialization

Pattern 1: Behaviour - Exercise Alone or in a Group?

When asked if individuals prefer exercising alone, in a group, or with an acquaintance, individuals who are not achieving the minimum recommended amount of physical activity per week were neither more likely to exercise alone than they were to exercise with an acquaintance. Conversely, individuals who achieve or go beyond the minimum recommended physical activity levels are likely to be doing so by themselves. For the former group, it can be determined that having the flexibility to exercise alone or with someone they know is important, while those who are consistently active need to be able to exercise on their own.

Pattern 2: Desire to Share

In open-ended responses, individuals shared reasons behind their desire to share fitness data and experiences. These reasons include motivation, accountability, support from friends, a sense of pride, and fun. However, when asked, "How important is social interaction to you when you exercise?" 15 out of 37 respondents indicated that the social aspect is not at all important. Yet, the remaining 22 respondents, which is the majority, do see value in social sharing with varying degrees of importance.

Pattern 3: Desire not to Share

Overall, 11 out of 28 respondents mentioned privacy concerns and believe their data is personal property. From the results of other questions related to the apps' socialization features, most of the responses are negative. From the open-end question, "Why do you choose to share or not share your fitness data and experiences with others?" We found that the dominant reason participants avoid sharing activity data is the perception that data is personal. Individuals are also concerned with privacy issues. For example, "I don't like sharing this info because it is sort of personal information for me" [P1], and "It's just my private zone,..." [P2]. Further, 2 respondents mentioned that competition discourages them from sharing data, "I don't like feeling like it's a competition..." [P3] and, "It doesn't really interest me as doing so frames it in a competitive light" [P4].

Pattern 4: Satisfaction with the Current Social Sharing Features

When asked to rate their experience with fitness wearables on various features, the lowest-rated experience was social sharing with a mean of 3.4 (on a scale of 1 to 5 from extremely dissatisfied to extremely satisfied), while the median and mode were both 3. This suggests that focusing on social sharing still has the potential to address users' pain points.

When asked if they share their fitness data with others, 22 out of 37 respondents said no, 9 said yes and 6 said sometimes. 10 of the 22 respondents who indicate that social interaction is important to them also indicate that they do not share their data. Throughout the study, it is clear that respondents are not satisfied with the social sharing features on their wearables. This suggests the reason behind users not sharing could be related to the lack of options they currently have on their wearables when it comes to social sharing.

Pattern 5: Social Sharing Preferences

When asked what aspects of their fitness data they would like to share with others, 20 out of 32 respondents indicate that they would like to share their progress, whereas, at a significantly lower rate, 12 participants said they would like to share their goals. In addition, 16 participants prefer to share the types of exercises they do, while 14 indicated that they would like to share their tips and advice on how to stay active. This data gives a good idea of what to include in our design if, should we still see value in focusing on the social aspect.

Theme 3: Gamification

Pattern 1: Mixed Satisfaction

For the question "How would you rate your fitness app(s)?" we asked individuals to rate several aspects of the apps they use including ease of use, available features, and

gamification. Except for gamification, respondents hold a clear attitude toward all the other features, which means the rating trends are instructive. Regarding the rating of the overall experience, 21 out of the 37 respondents rate are somewhat satisfied. For the available features rating, 20 out of the 37 respondents are somewhat satisfied. But for the gamification rating, the histogram chart shows a uniform distribution. There is no clear satisfaction trend for all different apps. We can imply that for the vast majority of apps, there is space to improve the gamification features which could potentially drive the positive trend of satisfaction level.

Pattern 2: No Consensus on / No Wearable Stands out When Using Gamification Features

No fitness wearable device, in particular, had better performing gamification features than another. Apple Watch, which had the largest use cases, was rated nearly equally unsatisfactory as it was satisfactory. In general, the levels of satisfaction and dissatisfaction for all the wearables were fairly evenly distributed across the possible rating levels.

Conclusion

We sought to verify our hypothesis with an understanding that wearables may contribute to users' beliefs around individual responsibility when it comes to their physical activity. After Study 1 indicated that few were able to reap the social benefits of physical activity through their wearable, we formulated the following questions to be answered in Study 2: How do social interactions encourage individuals' fitness activity? Can wearable apps further foster and enhance meaningful social interactions through fitness activity?

An initial look at the findings might lead us to believe that users do not place an emphasis on social motivation for exercise, contradicting our Study 1 findings. However, the emphasis was not due to a negative response to social sharing on wearables, but rather that the majority simply do not share but do see some value in sharing. Coupling this with the need for group exercising in participants who do not meet the suggested exercise threshold, it can therefore be concluded that there are some missed opportunities with current wearables and social features which could benefit the autonomy users need to motivate fitness, as per our hypothesis. Additional findings include recommendations for a greater emphasis on "active minutes", supported by better gamification features which are currently lacking across all wearable brands. Gamification features allow users to feel that the activity they are partaking in is accounted for and rewarded. This further supports their own control over their activity habits.

SYNTHESIS AND DESIGN RECOMMENDATIONS

The results of the Study 1 semi-structured interviews suggest that the social aspects of fitness activity are a major

factor for engagement in exercise. However, participants in this initial study did not describe reaping the “social” benefit of exercise through their wearable products. The overall aim of the Study 2 questionnaire was designed to understand how the experience of owning and using wearables can be enhanced through stimulating meaningful social interaction. The study addressed the questions: How do social interactions encourage individuals’ fitness activity? Can wearable apps further foster and enhance meaningful social interactions through fitness activity? These findings are intended to help our overall research questions of how we can design a new wearable application that would encourage adults to maintain long-term fitness activity.

Overall, the Study 2 findings highlight themes around adults with wearables not meeting the Canadian Physical Activity Guidelines, socialization and the benefits and missed opportunities around social sharing, and opportunities around gamification. Prior to conducting the study, our hypothesis was that people highly value social sharing and we were seeking a higher rate of respondents to indicate the desire to share. While our findings may discount our intention to focus on the social sharing aspect of wearables, the fact that the majority do not currently share does not necessarily mean that they would not like to or prefer to share. In addition, our findings indicate that there could be greater emphasis on activity data about “active minutes”. Perhaps this could be through elements of gamification. Considering our secondary research and Study 1 findings, it appears that respondents to the Study 2 questionnaire are not attaining or fully realizing the benefits of social sharing.

As such, we recommend the following design guidelines:

A. Social elements:

1. Allow users to share their progress, the types of exercises they do, tips and advice on how to stay physically active and their goals. Within its current state, wearable fitness applications lack the variety of options users need to socialize through sharing. Thus, this design suggestion will be crucial in making a more sociable fitness application.
2. Opportunities for real-time engagement and participation with friends (e.g. streaming on-demand or live video or audio classes). Our Study 1 findings showed that individuals feel the desire to share their fitness experience with others, especially with their friends. This not only motivates individuals to exercise more but also creates a sense of accountability.
3. Ensure users feel safe to share their personal activity data and address potential privacy concerns. After analyzing the Study 2 data, one of the main pain points identified was individuals’ concerns around privacy. Especially due to the nature of health data, which is widely accepted as personal and confidential information, it will be important to respect

users’ need for privacy and support this through design implementation. See IAPP’s Privacy by Design principles.

B. Focus on “moderate-to-vigorous intensity physical activity” versus steps:

4. People are keen on reviewing their data. It enables them to be accountable. However, there is a great focus on steps counting within the current wearable fitness application market. Steps show movement which is important, however, they are not the primary measure used in the Canadian Physical Activity Guidelines, which recommends 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week. Therefore, it would be a better approach to consider prioritizing moderate-to-vigorous physical activity minutes versus steps counting when it comes to fitness data tracking.

C. Gamification:

5. Integrate gamification through all design features and functions including social elements and viewable data, in particular, the minutes of moderate-to-vigorous intensity physical activity completed per week. While there is a great interest in gamification features, individuals did not express a high rate of satisfaction. Therefore, gamification has the potential to further motivate individuals to exercise through successful implementation of badges, rewards, leaderboards and creating a sense of competition.

With these design recommendations taken into consideration, a fitness wearable application can better serve users who could benefit from these improvements and, in turn, adopt and maintain a long-term active lifestyle.

CONCLUSION

In this project, we conducted two studies to address the problem of a majority of adults not meeting the recommended amount of moderate-to-vigorous intensity aerobic physical activity per week. We focused on “wearables” as this is the product specifically designed for assisting individuals to improve their active lifestyle behaviours. In our initial desk research, we learned that although this is a vast multi-million dollar market, it does not solve the problem of adult inactivity. In fact, researchers found that more than half of individuals who purchased wearables stopped using it and, of these, one-third did so before 6 months had passed.

We sought to understand why and how wearables fall short of their purported benefits for users. To do this we took an exploratory research approach. With this approach, we focused on the motivational systems, existing practices and processes, contextual knowledge and beliefs, and cognitive models. The goal of our first study was to gain an understanding of experiences into individuals’ lives during this pandemic and their efforts to maintain an active lifestyle. The study utilized the semi-structured interview method to collect data and draw conclusions. The goal of our second study was to gain an understanding of how the

experience of owning and using wearables can be enhanced through stimulating meaningful social interactions. A mixed qualitative and quantitative approach was taken. The insights derived from these findings were used in conjunction with the first study to inform product design guidelines.

Although our research approach enabled us to garner valuable insights for product design guidelines, there were some limitations. With respect to both study methods, data is self-reported and thus reflects users' perceptions and feelings making it, what some might consider, tenuous. That is because human memory is not perfect and recall is not entirely full or accurate. Participants may forget or recreate missing details. Participants do not know exactly what is relevant and details may have been omitted. Furthermore, participants may prioritize what they say. The "social desirability" effect on internal validity, in particular, may have impacted results due to the nature of the questions concerning one's own personal lifestyle behaviours. This may have impacted the trustworthiness of our measurements.

A second limitation concerns our limited data set due to the small number of participants in our studies. This is due to the short timeframe to recruit as well as the current COVID-19 pandemic lockdown and stay-at-home orders.

Finally, because we identified our target users as those who currently own or use wearables, we neglected to understand the behaviours, attitudes and motivations behind those who do not or have never used wearables. With this in mind, we would certainly address this cohort of individuals.

Overall, we are excited by the reporting of our findings and would want to work closely with product designers as they utilize our findings to iterate through their design. We suspect there would be tremendous value in conducting formative usability tests and other types of research. Ultimately, this will ensure product design is well informed and executed to advantage adults to meet the 150 minutes of the recommended amount of moderate-to-vigorous intensity aerobic physical activity per week.

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- CONTRIBUTIONS**
- Hanna Rochman: 25 percent
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