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Project: Correlating accelerometer data (FitBit) and exercise surveys as measurements of physical activity in cancer patients

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Introduction:
Obesity and physical inactivity are modifiable risk factors for incidences and prognosis of various cancers (Conn, 2006). For example, the International Agency for Research on Cancer of the WHO estimates a 20% to 40% decrease in risk of developing breast cancer among physically active women (Speck & Courneya, 2010), regardless of menopausal status, type or intensity of activity (Ballard-Barbash et al, 2012).

Unfortunately, the lack of physical activity following cancer diagnosis is common, possibly driven by the intensity of surgery, radiation and chemotherapy (Conn, 2006). With physical activity seen as an intrinsic part of addressing obesity (Speck & Courneya, 2010) and a promising foundation for cancer-specific research to be built on, an accurate measurement of physical activity is required (Takacs et al, 2014).

Prior research has measured physical activity in cancer patients using self-reported assessment tools such as questionnaires and activity logs (Lynch et al, 2010). However, there are several limitations to these approaches: recall bias leading to over-or underestimates of physical activity and sedentary times (Takacs et al, 2014); low accuracy with routine or domestic tasks (Lynch et al, 2010) and poor efficiency in gathering data simultaneously from a large population over longer-term monitoring (Gusmer et al, 2014). More recently, objective measurements have been explored with the use of pedometers and accelerometers (Lynch et al, 2010). However, there remains no single gold-standard wearable device to objectively measure physical activity in a free-living setting. Therefore, validation of data acquisition from the Fitbit One is needed to verify its use as a measure of physical activity (Takacs et al, 2014).

Aim:
To determine the feasibility of Fitbit One to measure physical activity in cancer patients. Should the Fitbit One device prove useful and reliable, we then plan to explore baseline physical activity in cancer patients and hopefully, providing a platform for future studies to explore the impact of exercise interventions on cancer survivors.

Method:
To address the aim of the study, participants with a diagnosis of colon, lung or breast cancer were recruited from the oncology outpatient clinic in Christchurch Hospital. Participants were asked to complete a baseline standard physical activity survey (PAS- McKenzie Cancer Research Group). They were asked to wear the Fitbit One for a week before completing a post-7-day survey. The Fitbit data was retrieved using a program called FitBitScraper, allowing for the generation of 15-minute- interval data over the week.

Results:
Sixteen participants were recruited for this study but two of which decided to discontinue due to personal reasons.

Our results were obtained from the remaining fourteen individuals. Seven were males and seven were females. The average age of the group was approximately 62 years and had an average BMI of 25. From the raw data, the average daily step count of each of the participants, trend of activity over a 24h-period and trend of activity over the days of the week could be generated. The WHO recommends a daily step count of 10,000 as a guideline of healthy lifestyle. Of the 98 days of data collected, only 22 days met this criterion, which only involved four of the fourteen participants. Correlation between the two sets of surveys and Fitbit One data were also assessed.

There was little to no correlation between the baseline survey and Fitbit One. However, the relationship between post-7-day survey and Fitbit One proved slightly better, displaying a 16% correlation.

To improve the correlation, the conversion of the Fitbit One data to METs equivalent (an estimated measurement of the PAS survey) was explored. However, it eliminated even the poor correlation between the two measurement tools.

Even though a poor correlation was evident between the post-7-day survey and the Fitbit One data, it was consistent with the results of previous studies of about 15-20% (Aadahil & Jorgensen, 2003). The similar findings from this study proved that the data extracted from the Fitbit One was likely accurate. It should also be known that the Fitbit One has been validated against other proven research accelerometers such as the GT1M ActiGraph (Gusmer et al, 2014). Recent literatures found that the Fitbit One was actually more accurate during lower walking intensities, which is evident in an older and more at-risk population (Takacs et al, 2014).

The primary aim of this study was to assess and determine the feasibility of the Fitbit One to measure physical activity in cancer patients. Our findings indicate that the Fitbit One is a reliable device for measuring daily step counts, which can be used to quantify the amount of physical activity or inactivity completed by an individual. It is known that cancer patients undergo physiological changes during treatments, which are often translated to change in physical activity levels (Markes et al, 2004).

Conclusion:
In spite of a limited data sample, it is suggested that the FitBit One can allow for the generation and analysis of individualised physical activity level. The ability to access and analyse intra-day data presents an aspect of statistical value that is not possessed by subjective measures.

Therefore, this study provides the impetus for future researchers to utilise the Fitbit One device as a form of baseline measure on specific groups of cancer patients, who are starting a fixed regimen of chemotherapy treatment. The data obtained would give clinicians an idea of how physical activity varies over the course of the treatment.