

**One Step at a Time:**  
**An examination of wearable fitness devices used for tracking activity and  
considering the motivational impact from their use.**

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requirements for the degree of Master of Science Interactive Digital Media

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## Summary

Wearable devices for tracking activity are designed for efficiency in reaction to developing technologies and knowledge. This paper questions how the micro-management of physical activity has implications for motivational human behaviour and the macro-issue of health and fitness.

The methodology of this Research Paper establishes a theoretical framework through literature reviews discussing the management of health and fitness through activity and exercise; devices and technologies as a tool for measurement and understanding; their use and integration in daily life as an extension of the body. A qualitative survey and critical analysis of results follows to evaluate the factors behind the take up and effectiveness of fitness trackers.

This research paper examines the relationship between users and wearable technologies. It substantiates that user attitudes and objective intentions often determine the fitness tracker they may adopt, and furthermore, are very much reflected in their actual use of certain devices. The research shows how fitness trackers offer a variety of means from which a user can draw motivation – that while statistics provided by a device may be presented as objective quantities, the user's subjective view of them may prompt them to engage in additional activity. The paper concludes that fitness trackers are more than simply just objective tracking devices but powerful motivational tools in promoting physical activity.

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## **RESEARCH INTRODUCTION**

Wearable devices for tracking activity are designed for efficiency in reaction to developing technologies and knowledge. This paper questions how the micro-management of physical activity has implications for human behaviour and the macro-issue of health and fitness. It will discuss the current market climate for wearable technologies and their reach.

It investigates how behavioural theory is integrated into wearable devices to produce motivational factors in the physical experience of activity. In documenting wearable devices as means of tracking human behaviour, it seeks to question the role of the device as container and calibrator, and crucially, as an instigator of active movement. The research question will be clarified once the necessary background has been discussed.

This research paper examines the relationship between users and wearable technologies firstly through literary reviews and observations, and secondly through qualitative surveying and critical comparative analysis.

## 1.1 THE IMPORTANCE OF SELF-KNOWLEDGE

Perhaps without even knowing, various different incidents inform and dictate much of what we as humans do on a daily basis. When considered, measurements make up more than just the mathematics of things, they have a pervasive impact on the course of our daily lives.

*'We spend much time each day measuring things: time (clocks and calendars)... quantities (lengths, volumes, weights), food (size of portions, recipes, calories, fat content)... health (vital signs, lab tests, cholesterol, blood pressure, weight), sports (scores, batting averages, records) and hundreds of other measures we use almost daily.'*<sup>1</sup> Measurements universally constitute things that form the world around us down to the make up of our own bodies. Activity defined is *'the state of being active; the quality or condition of being an agent or of performing an action or operation; the exertion of energy, force, or influence.'*<sup>2</sup>

For most people the notion of health and wellbeing is encapsulated by the *'soundness of body; that condition in which its functions are duly and efficiently discharged.'*<sup>3</sup> We can have our own perception of wellbeing, that is, to feel good within our bodies. To an extent we know what makes our bodies tick, however we cannot ever quantify what happens below the skin without the use of scientific technology or calibration. Measurement enhances our understanding – *"if you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it"*.<sup>4</sup> Physicist Lord Kelvin claimed that if you are unable to measure something, your understanding of it is "meager". That is to say, that which you measure is only a reflection of the amount of knowledge you possess and nothing more.

Without some means of specified observation and calculation we can never fully understand the physiological and biological changes our bodies are continuously undergoing.

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<sup>1</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 10.

<sup>2</sup> "activity, n." (2016). OED Online, Oxford University Press [online] Available at: <http://www.oed.com/view/Entry/1958?redirectedFrom=activity> [Accessed February 28, 2017].

<sup>3</sup> "health, n." (2016) OED Online, Oxford University Press [online] Available at: <http://www.oed.com/view/Entry/85020?rskey=s18NUy&result=1> (accessed February 28, 2017).

<sup>4</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 19.

Unmeasured things cannot be easily replicated, or managed, or appreciated.<sup>5</sup> Walter Cannon's (1932) concept of 'homeostasis' states '*the maintenance of a dynamically stable state within... conditions in the body (e.g. as regards blood temperature) by physiological processes that act to counter any departure from the normal.*'<sup>6</sup> Some evaluation of homeostasis when applied to health and wellbeing implies a condition of relative stability. Therefore it can be said that measurements are so required in order to gauge this sort of balance of health. In most cases with some exception, the way we measure success determines the success we will achieve.

## 1.2 THE POWER OF MEASUREMENT

Protagoras, the great Sophist philosopher of 5<sup>th</sup> century B.C.E., declared that '*Man is a measure of all things.*'<sup>7</sup>

As far as metaphors go: "*Measurement is the lock, feedback is the key. Without their interaction, you cannot open the door to improvement.*"<sup>8</sup> Basic measurement through counting specifically, in tandem with a steering device for an individual constitutes a way to target a goal and consistently work towards it. In order for people to engage with such guidelines as those offered by the World Health Organisation, people require devices to help them do so. As health and fitness remains a hot topic in the present day, the market for monitors helping to track physical activity goals and healthy lifestyle variables is inevitably growing. The most used output parameter from these monitors is the cumulative step count over a day, week and beyond. This convenient and simply quantifiable output may seem insignificant, yet if constantly maintained and better yet improved upon it can support an individual in achieving their physical activity goals and maintaining a healthy lifestyle.

For the average person, understanding the sheer complexity of the human body is not of major concern, yet we are still interested in how we care for it through our lifestyle choices.

In a modification of the Protagorean epigram, Herbert Arthur Klein further commented:

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<sup>5</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 11.

<sup>6</sup> "homoeostasis, n." (2016) OED Online, Oxford University Press [online] Available at: <http://www.oed.com/view/Entry/88025?redirectedFrom=homeostasis> [Accessed February 28, 2017].

<sup>7</sup> Klein, H. A. (1974) *The Science of Measurement: A Historical Survey*, New York: Dover Publications, pp. 23.

<sup>8</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 18.

*“Man is a measurer of all things.”*<sup>9</sup> Measuring is increasingly becoming human trait – to set that within the context of this paper, we presently find ourselves in a first world obsessed with calories and counting of their output and intake within our bodies.

Research and extensive studies have provided substantial evidence to support the importance of habitual physical activity in maintaining good health and preventing chronic disease. A correlated understanding of the relationship between habitual physical activity and health must be established in order to define *‘an optimal quantity of physical activity needed to produce improvements in health.’*<sup>10</sup> Similarly accurate methods of physical activity assessment are therefore needed. *‘At present, researchers encounter difficulties in measuring habitual physical activity levels noninvasively and accurately. To further explore the relationship between physical activity and health, a method that would address these issues is required.’*<sup>11</sup>

The World Health Organisation (WHO, 2010) and other global institutions have published guidelines that recognise the benefits of physical activity for general health.<sup>12</sup> WHO draw their guidelines from conclusive scientific evidence and various in-depth studies in the field, proving that people regularly engaged with physical activity *‘have higher levels of health-related fitness, a lower risk profile for developing a number of disabling medical conditions, and lower rates of various chronic non-communicable diseases than do people who are inactive.’*<sup>13</sup>

Recommended guidelines state in order to maximise the health benefits of physical activity for the general population, activities such as brisk walking or running, should be carried out daily.<sup>14</sup> Aerobic activity, also called endurance activity, improves cardiorespiratory fitness. A combination of aerobic and muscular exercise must be taken up *‘in order to improve cardiorespiratory and muscular fitness, bone health, reduce the risk of NCDs and*

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<sup>9</sup> Klein, H. A. (1974) *The Science of Measurement: A Historical Survey*, New York: Dover Publications, pp. 23.

<sup>10</sup> Strath, S. (2000) ‘Evaluation of heart rate as a method for assessing moderate intensity physical activity’, In: *Medicine & Science in Sports & Exercise*, 32(9), Suppl., pp. S465.

<sup>11</sup> Ibid.

<sup>12</sup> O’Connell, S., O’Laighin, G., & Quinlan, L. (2017) ‘When a Step Is Not a Step! Specificity Analysis of Five Physical Activity Monitors’, *PLoS ONE* [online], 12(1): e0169616, doi:10.1371/journal.pone.0169616 [Accessed 27 March 2017], pp. 2.

<sup>13</sup> World Health Organization (2010) *Global Recommendations on Physical Activity for Health*, [online], Available at: [http://whqlibdoc.who.int/publications/2010/9789241599979\\_eng.pdf?ua=1](http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf?ua=1) [Accessed on: 27 March 2017], pp. 26.

<sup>14</sup> Ibid., pp. 20.

depression.<sup>15</sup> Through this we begin to establish that the specific nature of an activity directly correlates to some aspect of one's physical and mental health.

*'Measurement systems create the basis for effective management'*<sup>16</sup> – effective measurement therefore defines a true value when carried out properly and accurately. The benefits that come from the ability to measure things in relation to health are manifold – physical activity is no exception to the rule. *'Change one key measure that is currently driving the wrong behavior'* in order for to see improvement – this concept establishes ground for encouraging physical activity by means of measurement.<sup>17</sup>

Some argue that all measurement must be specific and accurate in order to be truly effective. The validity of objective measurements from fitness tracking devices remains contested due to many studies being highly heterogeneous. Activity monitors have been less accurate at slow walking speeds and information about validated activity monitors in chronic disease populations is lacking.<sup>18</sup> Some output variables from commercially available monitors may not possess absolute validity.<sup>19</sup> In terms of measuring activity, studies have shown: *'Objective and subjective measures of physical activity give qualitatively similar results regarding gender and age patterns of activity. However, adherence to physical activity recommendations according to accelerometer-measured activity is substantially lower than according to self-report.'*<sup>20</sup> While accuracy in terms of measured quantities accounts for the optimal outcome, this paper contends that a place exists for 'rough' measurements to be as effective in motivational practices.

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<sup>15</sup> World Health Organization (2010) *Global Recommendations on Physical Activity for Health*, [online], Available at: [http://whqlibdoc.who.int/publications/2010/9789241599979\\_eng.pdf?ua=1](http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf?ua=1) [Accessed on: 27 March 2017], pp. 26.

<sup>16</sup> Reichheld, F. F., & Teal, T. (1996). *The Loyalty Effect: The Hidden Force Behind Growth, Profits, And Lasting Value*. Boston, Mass: Harvard Business School Press, pp. 246.

<sup>17</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 15-20.

<sup>18</sup> Van Remoortel, H., Giavedoni, S., Raste, Y., Burtin, C., Louvaris, Z., Gimeno-Santos, E., ... Troosters, T. (2012). Validity of activity monitors in health and chronic disease: a systematic review, In: *The International Journal of Behavioral Nutrition and Physical Activity*, 9 (84).

<sup>19</sup> Mahar, M. T., Maeda, H., Sung, H., & Mahar, T. F. (2014). 'Accuracy of the nike fuelband and fitbit one activity monitors', *Medicine and Science in Sports and Exercise*, 46(5).

<sup>20</sup> Troiano, R., Berrigan, D., Dodd, K., Mâsse, L., Tilert, T., & McDowell, M. (2008) *'Physical Activity in the United States Measured by Accelerometer'*, In: *Medicine & Science in Sports & Exercise*, 40(1), pp. 181-187

Various studies indicate that fitness trackers do however allow individuals to accurately monitor their activity in order to achieve physical activity goals.<sup>21</sup> People can read and take advantage of other indicators that measurements provide, whether they are specific or not. Measurable quantities have many functions when applied to health and fitness, particularly self-organisation and self-management – measurement focuses attention; provides the basis for goal-setting; increases the visibility of performance; clarifies expectations; enables accountability; enhances understanding, and promotes consistency.<sup>22</sup>

When the principle of ‘effective management’ is practiced it produces results that can be evaluated. The guidelines for physical activity as documented by the WHO support this approach: *‘a progressive increase in activity to eventually achieve the target... is recommended. It is appropriate to start with smaller amounts of physical activity and gradually increase duration, frequency and intensity over time.’*<sup>23</sup> The incremental increase of a person’s measured activity over time constitutes a way to improve their health and fitness. Furthermore, these improved measurements fostered by an active lifestyle leads to the consistent effect of achieving weight maintenance. *‘Accumulation of energy expenditure due to physical activity is what is important to achieving energy balance’*<sup>24</sup> – that is to say that conditions in the body must be seen to balance in order to be considered fit and well.

*‘Measurement tends to make things happen; it is the antidote to inertia’.* Measurement has the inherent power to motivate. When given markers or points of reference, the will power of a person to improve can be boosted when they can quantify what it takes to better the original state. Without measurable goals, objective tracking cannot be truly achieved which often leads to a loss of enthusiasm and disengagement from efforts to improve. People favour that which can be measured – *‘measurement releases powerful motivational forces— including initiative, pride in accomplishment, peer pressure, and competitiveness.’*<sup>25</sup> The most prominent example of measurement as a motivational function is exemplified by any

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<sup>21</sup> Tucker, W., Bhammar, D., Sawyer, B., Buman, M., & Gaesser, G. (2015) ‘Validity and reliability of Nike + Fuelband for estimating physical activity energy expenditure’, In: *Medicine and Science in Sports and Exercise*, 7(14).

<sup>22</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 15-20.

<sup>23</sup> World Health Organization (2010) *Global Recommendations on Physical Activity for Health*, [online], Available at: [http://whqlibdoc.who.int/publications/2010/9789241599979\\_eng.pdf?ua=1](http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf?ua=1) [Accessed on: 27 March 2017], pp. 18.

<sup>24</sup> *Ibid.*, pp. 25.

<sup>25</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 20.

athlete's competitive performance – a continued dedication to surpass and self-motivate themselves to higher levels of performance.

While high-level performance is not on everyone's radar, the advantages of measuring being able to facilitate feedback and motivate as consequence still apply. Measurement and feedback are central to the World Health Organisation guidelines aimed at improving general health of the global population. In line with the WHO recommendations, many individuals aim to improve on their physical activity levels by reaching a personal goal or the recommended objective goal of 10,000 steps per day.<sup>26</sup> The cumulative logging of steps can become a simple yet key factor in the promotion and maintenance of physical activity levels and mental wellbeing.<sup>27</sup> The accuracy and precision of some devices may be debated in terms of objective tracking, however the subjective motivational aspects to engage in activity formed as a result of using a fitness tracker in the first instance may well hold greater weight in such arguments.

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<sup>26</sup> O'Connell, S., O'Laighin, G., & Quinlan, L. (2017) 'When a Step Is Not a Step! Specificity Analysis of Five Physical Activity Monitors', PLoS ONE [online], 12(1): e0169616, doi:10.1371/journal.pone.0169616 [Accessed 27 March 2017], pp. 2.

<sup>27</sup> Ibid.



## 2.1 MEASURING TECHNOLOGIES

As Louis Pasteur said, *“A science is as mature as its measurement tools.”*<sup>28</sup>

The use of wearable fitness trackers, just one of the latest developments in the evolution of information technology, provides means for individuals in the general population to track physical activity. As measuring technique tools they provide *‘the most useful bridge between the everyday worlds of the layman and of the specialists in science.’*<sup>29</sup>

At the most basic level pedometers and Heart Rate monitoring pieces of technology are devices that are *‘relatively low cost, noninvasive, and able to give information on the pattern of physical activity.’* By using wearable technologies they give users quantifiable figures and therefore insights into how their body works. ‘Fitness tracking’ as a concept measures a person’s performance and statistics through usual activities during the course of the day. Basic statistics measured by simple devices may be things like steps taken, heart rate, calories burned while complex technologies may go further into temperature monitoring, stress levels and sleeping states. Together the array of information collected by the tracker paints a somewhat-complete picture of a person’s health.

With the aforementioned context in mind, the landscape of wearable fitness tracking technologies has grown significantly in the past decade. In 2015 the revenue from the global healthcare wearable devices stood at \$5.1 billion for the year and stated it furthermore *‘expects that to increase to \$18.9 billion in 2020.’*<sup>30</sup> The steadily growing case has seen the International Data Corporation (IDC) predict the worldwide market for smartwatches and other wearables to reach more than 111 million units in 2016, reflecting an increase of 44% compared to 2015. *‘More than eighty percent of these devices will be wrist-worn devices -*

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<sup>28</sup> Spitzer, D. (2007) *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association: New York, pp. 10.

<sup>29</sup> Klein, H. A. (1974) *The Science of Measurement: A Historical Survey*, New York: Dover Publications, pp. 24.

<sup>30</sup> O’Brien, C. (2016) ‘Does wearable technology deserve clean bill of health?’ In: *The Irish Times* [online], 22 September 2016, Available at: <http://www.irishtimes.com/business/technology/does-wearable-technology-deserve-clean-bill-of-health-1.2798460> [Accessed 8 March 2017]

smart wristbands.<sup>31</sup> It is no coincidence that major platforms, notably Apple WatchOS and Android Wear, have pivoted towards fitness and health applications.<sup>32</sup>

## 2.2 CURRENT MANUFACTURERS AND RELATIONSHIP WITH AUDIENCE ATTITUDE

This section reviews the state of the current fitness wearables market in order to establish context for future discussion of devices in this paper.

The current climate for wearables has reached a new all-time high on the worldwide market - 'shipments reached 33.9 million units in the fourth quarter of 2016 (4Q16), growing 16.9% year over year.'<sup>33</sup> Of that figure for 2016, 85% was accounted for by 'basic wearables', primarily comprised of fitness bands.<sup>34</sup> While the end quarter of 2016 appeared to show lagging sales in wearables, a burst of new vendors entered the market and previous champions refreshing their product lineups helped salvaged the fortunes of the year.<sup>35</sup> Despite the shift in changing developments being made, the regular leading manufacturers remained strong. In this section we will establish the main players in the market, examine the competition that exists, and furthermore consider the direction fitness wearables are moving towards.

Fitbit continues to hold the market lead for wearables and has continued to grow, owning the greatest share of the fitness wearables market with approximately a quarter of it to date.<sup>36</sup> Having been established since 2007, the vendor has an extensive list of products with the intention 'to create a wearable product that would change the way we move'.<sup>37</sup> Fitbit's

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<sup>31</sup> Chuah, W. (2016) 'Wearable technologies: The role of usefulness and visibility in smartwatch adoption', In: *Computers in Human Behavior*, 65, pp. 276.

<sup>32</sup> Hunt, G. (2017) 'Fitness and health tools driving wearable market to record levels', Siliconrepublic [online], Available at: <https://www.siliconrepublic.com/companies/wearables-fitbit-apple-fitness-tracker> [Accessed 8 March 2017].

<sup>33</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>34</sup> International Data Corporation, (2016). *Fitness Trackers in the Lead as Wearables Market Grows 3.1% in the Third Quarter, According to IDC* [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS41996116> [Accessed 11 Apr. 2017].

<sup>35</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*, Ibid.

<sup>36</sup> International Data Corporation, (2016). *Fitness Trackers in the Lead as Wearables Market Grows 3.1% in the Third Quarter, According to IDC*, Ibid.

<sup>37</sup> Odih, P. (2016) *Adsensory Financialisation*, Newcastle upon Tyne, UK : Cambridge Scholars Publishing, pp 107.

dominance as a producer of fitness wearables is mostly unrivalled, yet recently challengers have shifted their focus in attempt to take a bite of Fitbit's market share. The brand has grown steadily across the world however they presently face a decline in the U.S. market due to the over saturation of similar low-cost fitness tracking products.<sup>38</sup>

The approachable design and vast range of Fitbit devices appeal to the general masses with the intention to track their activity some way. Fitbit devices tell their users what they are doing are in a simplified engaging manner, the information easy to discern and seamlessly integrated into each user's daily lifestyle. Their marketing strategy proves to be the most popular garnering the most social media engagement, creating a solid image amongst consumers.<sup>39</sup> The result of Fitbit's clear, concise, encouraging and motivational branding captures the potential casual users with varied intentions while similarly appealing to those with a strong sense of brand awareness.

As a similar heavy-weight competitor, Apple has entered the fitness tracking market with their own line. Ramon T. Llamas, the research manager for IDC's Wearables team commented that *'Fitbit and Apple both enjoy a warm reception in the U.S. wearables market'*.<sup>40</sup> Apple users seem to demonstrate a high 'brand attitude or loyalty' and do so in their uptake of Apple products<sup>41</sup> – the Apple Watch acquires such a user based through this trend. That being said, users have been similarly drawn to their fitness tracking endeavours – *'Apple is one of the few companies that has been able to quickly refocus its watch to gain traction in the consumer market and has also been leading the charge on introducing the smartwatch category to the commercial segment.'*<sup>42</sup>

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<sup>38</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>39</sup> Pinto, M., & Yagnik, A. (2016) 'Fit for Life: A Content Analysis of Fitness Tracker Brands Use of Facebook in Social Media Marketing', In: *Society For Marketing Advances Proceedings* [serial online], November 2016, pp. 486-487. Available from: Business Source Complete, Ipswich, MA. Accessed May 8, 2017.

<sup>40</sup> International Data Corporation, (2017). *Satisfaction with Wearable Devices, 2016*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42303117> [Accessed 11 Apr. 2017].

<sup>41</sup> Chuah, W. (2016) 'Wearable technologies: The role of usefulness and visibility in smartwatch adoption', In: *Computers in Human Behavior*, 65, pp. 282.

<sup>42</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*, Ibid.

The latest generation watches launched towards the end of 2016 proved to be a commercially savvy move and resulted in their most successful sales quarter to date.<sup>43</sup> Their improved success comes off the back of addressing consumer concerns regarding the '*aging lineup and an unintuitive user interface*'. Though both issues have been considered with the latest generation watches, Apple's success will likely be muted as the smartwatch category continues to be challenged.<sup>44</sup> The lower entry price point and the inclusion of GPS functionality along with a completely revamped user interface have helped the company grow its presence.<sup>45</sup>

Brand awareness plays a significant role in the wearables market, a factor that IDC's Llamas appreciates given the popularity of Fitbit and Apple; '*they are not the only ones as companies like Garmin and Samsung have gained their own respective followings*'.<sup>46</sup> Garmin and Samsung take up two other positions in the top 5 standings for fitness wearables. Garmin itself engages in targeting users with their social media presence being more active and frequent than that of Fitbit online.<sup>47</sup>

In contrast to Fitbit's one-size fits all approach which misses an opportunity to target different kinds of specific users, the audience that Garmin attracts are a very focused and dedicated fitness following. This has translated well with the company encouraging users to graduate from simpler fitness trackers to more complex and pricier tracking watches that they now offer. At the CES 2017 show, Garmin announced their new Fenix 5 with promise that a new smaller size would help the device appeal to a broader audience.<sup>48</sup>

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<sup>43</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>44</sup> International Data Corporation, (2016). *Fitness Trackers in the Lead as Wearables Market Grows 3.1% in the Third Quarter, According to IDC* [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS41996116> [Accessed 11 Apr. 2017].

<sup>45</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*, Ibid.

<sup>46</sup> International Data Corporation, (2017). *Satisfaction with Wearable Devices, 2016*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42303117> [Accessed 11 Apr. 2017].

<sup>47</sup> Pinto, M., & Yagnik, A. (2016) 'Fit for Life: A Content Analysis of Fitness Tracker Brands Use of Facebook in Social Media Marketing', In: *Society For Marketing Advances Proceedings* [serial online], November 2016, pp. 486-487. Available from: Business Source Complete, Ipswich, MA. Accessed May 8, 2017.

<sup>48</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*, Ibid.

Meanwhile Samsung continues to offer competition around the globe beyond smartphone technology. Thanks to bundles offered with their Note 7 and other Samsung smartphones they continued to be able to move large volumes of their latest wearables for 2016.<sup>49</sup>

Rounding out the top 5 wearable standings is China’s electronics company Xiaomi. For the 2016 year, Xiaomi's relentless growth (15.2% of market share) helped to close the gap between it and Fitbit (19.2% of market share) as the top vendor.<sup>50</sup> Like its other product lines, the company has stuck with a low-cost strategy and has slowly tried to veer upstream in terms of pricing by introducing new devices with heart rate monitoring and a mildly higher selling price. However, Xiaomi still lacks the expertise and brand recognition to expand beyond its native borders in China.<sup>51</sup>

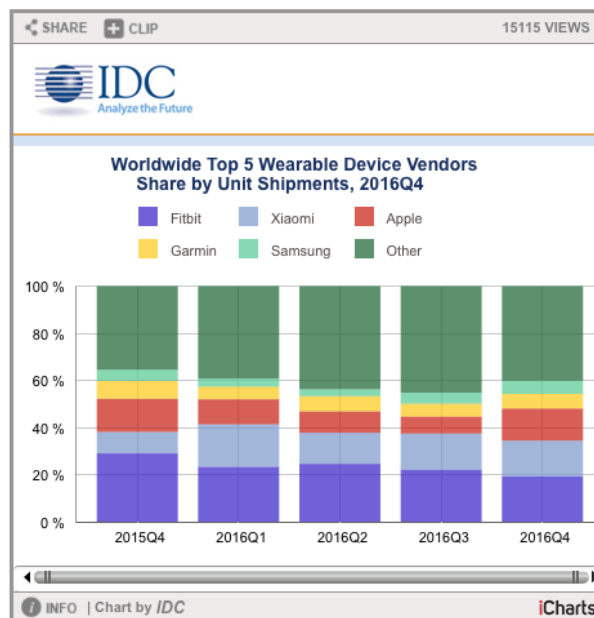


Figure a. *Worldwide Top 5 Wearable Device Vendors Share by Unit Shipments, 2016Q4.*<sup>52</sup>

Beyond the five manufacturers listed above, 40% of the rest of the market is comprised of other complex and basic wearables – ‘On average, three in four wearable devices shipped

<sup>49</sup> International Data Corporation, (2016). *Fitness Trackers in the Lead as Wearables Market Grows 3.1% in the Third Quarter, According to IDC* [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS41996116> [Accessed 11 Apr. 2017].

<sup>50</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC.* [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>51</sup> Ibid.

<sup>52</sup> Ibid.

were basic, while one in four was smart (i.e., with ability to run third-party programs).<sup>53</sup>

One thing for certain is that the technology market is changing and evolving. The lines between fitness trackers and smart wearables are continuously being blurred. *'Basic wearables started out as single-purpose devices tracking footsteps and are morphing into multi-purpose wearable devices, fusing together multiple health and fitness capabilities and smartphone notifications.'*<sup>54</sup> The main point of distinction appears to be determined by software functionality.

Regardless of this distinction, a fiercely competitive market now exists as companies are found vying for potential or existing consumers, for better or worse – *'This has led some companies to develop devices that behave more like smartphones while others have quietly shut their doors.'*<sup>55</sup> The 2016 slowdown in the market indicated *'an increasingly fickle marketplace looking for further functionality beyond what it has seen thus far'*.<sup>56</sup> As mentioned before, the release of new devices towards the end of the year prompted a surge and indicated new directions that wearables are likely to take for 2017 – *'cellular connectivity, closer attention to design, watches that actually look like watches, and an emphasis on third-party applications began to take root during the year, pointing to continued development. These will help shore up the user base of wearables while adding new users going forward.'*<sup>57</sup>

Despite new vendors entering the market bringing strengths from other industries, according to IDC the main source of market growth appears to be driven by vendor push rather than consumer demand.<sup>58</sup> Though wearables are expected to maintain *'a positive outlook'*, no manufacturer has reason to feel completely secure, as there are still an

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<sup>53</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>54</sup> Ibid.

<sup>55</sup> International Data Corporation, (2017). *U.S. Wearables Market Shares, 2016: Fitbit Keeps Grip* [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42352317> [Accessed 11 Apr. 2017].

<sup>56</sup> International Data Corporation, (2017). *Worldwide Wearables Market Shares, 2016: Fitbit Retains Leadership*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42352217> [Accessed 11 Apr. 2017].

<sup>57</sup> International Data Corporation, (2017). *U.S. Wearables Market Shares, 2016: Fitbit Keeps Grip*, Ibid.

<sup>58</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*, Ibid.

outstanding percentage of users that are either *'neutral or dissatisfied with their experience'*.<sup>59</sup>

IDC does however report *'high satisfaction for health and fitness'* wearables and highlights the continued potential they hold within the market. *'Health and fitness has long been the key value proposition for most wearable devices, so it's a good sign that this ranked highest in terms of user-respondent satisfaction'*.<sup>60</sup> In a reflection of the past year and moving forward, the IDC commented that *'more meaningful health and fitness insights all sowed their seeds in 2016, and in 2017 we should also see them bear fruit. This will help shore up the base of wearable device users and entice those who have been considering, but have not yet purchased, a wearable device.'*<sup>61</sup>

## 2.4 PERCEPTION OF USEFULNESS

Fitness trackers have moved into a realm where they are no longer just solitary single-use devices with the purpose of objective tracking. Their perceived usefulness and visibility can be seen to dictate their adoption by people yet questions remain as to what factors prompt such adoption behaviour. Traditional technology acceptance models consider factors such as *'user-friendliness ('ease of use') and utilitarian benefits ('perceived usefulness') [as] core determinants.'* As a way to categorise this new growing fitness tracking technology for consumers, technology acceptance theories view them and other smartwatches as smaller compact versions of existing technologies such as organisers or smartphones.<sup>62</sup>

Considering where these technologies began from: *'functioning and visibility of a traditional watch [could] also position it as a luxury good (Carlson, 2015) – rather than hiding a technology, technology and fashion merge to become a prominent part of a user's self.'*<sup>63</sup>

New manufacturers and existing fashion icons are tapping into the 'fashion visibility' niche of the market in an attempt to gain traction. Jitesh Ubrani senior research analyst for IDC

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<sup>59</sup> International Data Corporation, (2017). *Satisfaction with Wearable Devices, 2016*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42303117> [Accessed 11 Apr. 2017].

<sup>60</sup> Ibid.

<sup>61</sup> International Data Corporation, (2017). *Worldwide Wearables Market Shares, 2016: Fitbit Retains Leadership*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=US42352217> [Accessed 11 Apr. 2017].

<sup>62</sup> Chuah, W. (2016) 'Wearable technologies: The role of usefulness and visibility in smartwatch adoption', In: *Computers in Human Behavior*, 65, pp. 277.

<sup>63</sup> Ibid., pp. 276.

Mobile Device Trackers stated: *"As the technology disappears into the background, hybrid watches and other fashion accessories with fitness tracking are starting to gain traction. This presents an opportunity to sell multiple wearables to a single consumer under the guise of 'fashion'... it helps build an ecosystem and helps vendors provide consumers with actionable insights thanks to the large amounts of data collected behind the scenes."*<sup>64</sup>

In contrast to functionality, the popularity of wrist-worn trackers can also be measured by their visibility as a fashion accessory. Most modern devices *'include a fashion and a technology component; they need to fulfill functional, hedonic, and even social needs of their target groups.'*<sup>65</sup> Regardless of what additional aspects or features they include, the primary function of a fitness tracker should be to quantify some state of a users' health and fitness.

Many methods have attempted to understand the uptake of new technologies in the ever-changing digital world. The Technology Acceptance Model (TAM) offers a common way to study a user's adoption of the communication of information and new technologies based on the theory of reasoned action. The method itself is significantly rooted in behavioural psychology (Ajzen & Fishbein, 1980). As thoroughly discussed in the previous section, the purpose of TAM is to assess something in a measurable manner – in this context, it means to quantify 'perceived usefulness' which in turn influences usage intention.<sup>66</sup> 'Perceived usefulness' is construed as *"the extent to which a person believes that using particular technology will enhance his/her job performance"* (Davis, 1989, p. 320). Thus, from a motivation perspective, *perceived usefulness is a measure of a user's level of extrinsic motivation and outcome expectancy'*.<sup>67</sup>

Numerous technological advancements have enabled fitness wearables *'to store information over a period of days or weeks, thus providing data on various components of physical activity, including frequency, intensity and duration.'*<sup>68</sup> The potential benefits in what these fitness wearables offer are clear in terms of their ability to gather information to monitor

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<sup>64</sup> International Data Corporation, (2017). *Wearables Aren't Dead, They're Just Shifting Focus as the Market Grows 16.9% in the Fourth Quarter, According to IDC*. [online] Available at: <http://www.idc.com/getdoc.jsp?containerId=prUS42342317> [Accessed 11 Apr. 2017].

<sup>65</sup> Chuah, W. (2016) 'Wearable technologies: The role of usefulness and visibility in smartwatch adoption', In: *Computers in Human Behavior*, 65, pp. 282.

<sup>66</sup> Ibid., pp. 277.

<sup>67</sup> Strath, S. (2000) 'Evaluation of heart rate as a method for assessing moderate intensity physical activity', In: *Medicine & Science in Sports & Exercise*, 32(9), Suppl., pp. S465.

<sup>68</sup> Ibid.



health variables. In addition to their functional capabilities, their commercial viability as fashionable technologies furthermore increases the market for their target audience. Varying in cost, complexity and functionality in design, wearable fitness tracking technologies have generated a new way of promoting healthy lifestyles across diverse groups and populations. Yet, for these devices to reach their full potential in facilitating positive health behaviour changes, they must support existing evidence-based lifestyle interventions on both a short and long-term basis.<sup>69</sup>

With respect to the benefits outlined above, this paper argues that it is perhaps the motivational aspects that fitness trackers have in impacting human behaviour that make them most effective and valuable. Beyond the objective measurements and continued calibration of information, it is the relationship that a person fosters with their device that is of prime importance. Users demonstrate a particular attitude and intention which appears to be reflected through their use of device, they shape their own motivations which manifest as a subjective response.

The purpose of this research paper is therefore to investigate and critically evaluate the use of these wearable fitness trackers. *'It is reported that 40 to 65% of individuals drop out of a physical activity program within 3–6 months. Physical activity is a complex behaviour associated with multiple correlates which promote adherence.'*<sup>70</sup> The question being asked is whether current day fitness trackers are being used more than just for objective tracking. It seeks to ask if fitness trackers encourage self-improvement and generate motivation in users to be active, both in order to drive people towards healthier more active lifestyles.

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<sup>69</sup> Naslund, A., Aschbrenner, K., and Bartels, S. (2016) 'Wearable devices and mobile technologies for supporting behavioral weight loss among people with serious mental illness', In: *Mental Health and Physical Activity*, vol. 10, pp. 11.

<sup>70</sup> Monedero, J. Lyons, E. & O'Gorman D. (2015) 'Interactive Video Game Cycling Leads to Higher Energy Expenditure and Is More Enjoyable than Conventional Exercise in Adults', In: *PLoS ONE* 10(3): e0118470, pp. 1.

### **3.1 THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESIS**

As discussed, there exists a significant market for vendors of various fitness wearables. The success of the market inherently depends on the interest of consumers in the products they offer. Reasons for interest and investment therefore depend on consumer notions of perceived usefulness – physical functionality and motivational purpose, while similarly tapping into aspects of “fashionability” and attitude towards the adoptive use of technology.

The methodology of this Research Paper has established the theoretical framework through literature reviews discussing managing health and fitness through activity and exercise; devices and technologies as a tool for understanding the body; their use and integration in daily life as an extension of the body. The research analysis follows by examining the factors behind the take up and effectiveness of fitness trackers.

For the purpose of this research piece a ‘fitness tracker’ is defined as any wearable device to be worn on the wrist that is specifically designed to track and monitor a person’s movement, daily activities, and vital statistics in relation to health and fitness.

The aim of this Research Paper is to gauge whether the intentions in the uptake of fitness trackers are truly in line with the purpose of objective tracking they are made for. Themes described in the previous chapters will guide the discussion and provide the framework for evaluation. While the outputs given by fitness trackers are of measurable quantities in relation to aspects of health and fitness, this research paper also intends to evaluate how people use their devices, interpret information tracked for them and find motivation as a result – the outcome expects to illustrate what motivates people to use such devices and how. This paper intends to prove that fitness trackers are more than simply just objective tracking devices but powerful motivational tools in promoting physical activity.

### 3.2 METHOD – QUALITATIVE SURVEY DESIGN

A survey was administered online through Google Forms to capture the views of a portion of the general population with experience of using a fitness tracker and who are engaged with health and fitness. The specific purpose of the questionnaire was to collect varying contemporary views to be evaluated in the background theory of this paper. A qualitative approach was taken to be the subjective lens to answer the research question and pursue data related to those with experience of using fitness trackers.

The questionnaire began with a brief description of the research project purpose ('An examination into the usage of fitness trackers by the general population') and guaranteed anonymity for all participants willing to take part. Following the explanation, definition of what a fitness tracker is for this research paper was added.

The primary research question revolves around what are wearable fitness tracking technologies doing for people using them. Questions asked were devised to both potentially confirm trends established in the theoretical framework of this paper and to recognise emergent and exploratory strands within context. By considering activity as the primary context of their use in order to assess the value of such devices in everyday life, the survey was designed to ask questions around the following themes:

- What attitudes and intentions initially motivative or influence an individual to adopt a fitness tracker? What attitudes do owners of particular fitness trackers demonstrate and are they reflected through how they use the device?
- What aspects of fitness trackers are they utilising in reference functionality and how? Are they being used as originally intended; if not, how so? What conclusions can be drawn relating to human behaviour as a result?
- How do people respond to or draw motivation from their fitness trackers? What impact (if any) does an element(s) of competition have on encouraging endeavours towards better health and wellbeing? Are there cases of people using or integrating their use in such a way?

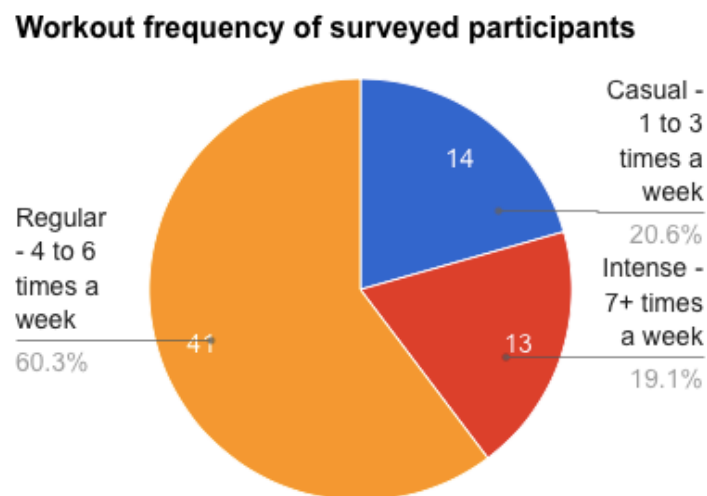
### 3.3 QUESTIONNAIRE RESULTS - EVALUATION AND CRITICAL ANALYSIS

Preparing the collected data began by addressing any answers to open-ended free text questions. This required coding to establish certain parameters such as participant profiles, quantities relating to devices owned or the similarity of answers regarding singular themes.

The participants were of a sampling of those interested in their health and fitness, meaning the probability of them using a fitness tracker was more likely. Of the [68 consenting participants](#) the following data and findings are applicable:

#### 3.3.1 CATEGORISATION OF PARTICIPANTS

The submitted data revealed the popularity of specific devices owned and used by the sample group. [68 participants](#) listed the fitness trackers they currently used or have used. The participants were separated into categories dependent on their stated workout frequency, with results proving the active nature of the sample group (*Figure 1*).



*Figure 1. Categorisation of [68 participants](#) by workout frequency in answer to question 'How many times a week would you set aside time to work out?'*

This categorisation realises that the population is not uniform and that it is therefore sensible to breakdown the participants into relative groups. The purpose is to use 'frequency' as means of separation and will be furthermore used to guide evaluations in this analysis.

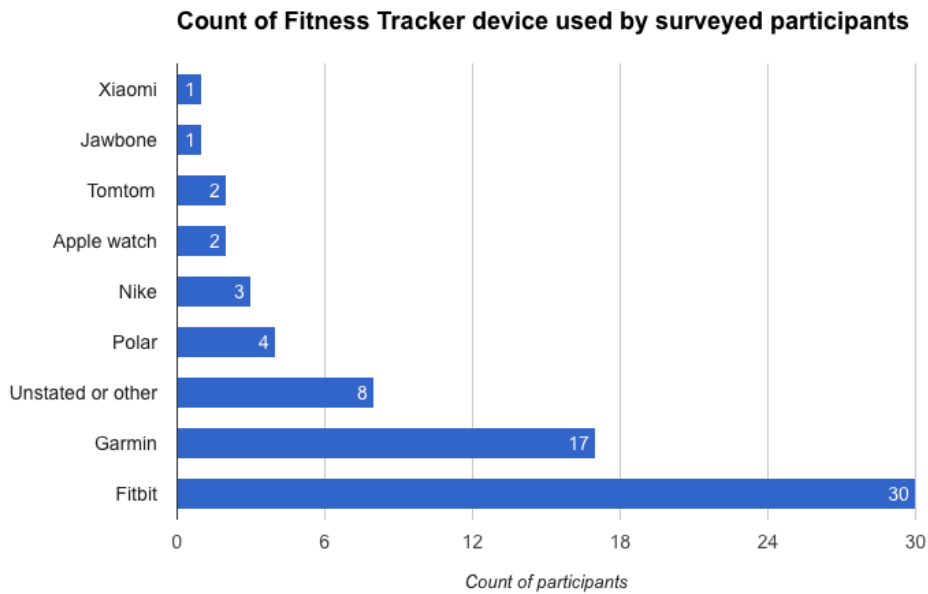


Figure 2. Count of fitness trackers by sample group users (68 participants)

Much in keeping with the current market figures, the vast popularity of Fitbit is most evident with 44% of participants stating their ownership of a Fitbit product for fitness tracking. A Garmin tracker was owned by 25% of the group, making Garmin the second most popular brand in the context of this survey. By observing the nature of the sample group having been based in Ireland, the Chinese brand Xiaomi only registered one owner, proving that Xiaomi’s prominence beyond the Chinese market does indeed still remain flat.

It is also similarly interesting to note that the majority of those participants, 68 to count, stated a known brand of fitness tracker indicating the acceptance of the brands operating in the wearables market. Of those who left the option blank, only one participant openly stated that they used a ‘generic device that calculates steps, calories, and heart rate’.

The distribution of fitness tracker per categorisation of workout frequency showed that Fitbit and Garmin were the most dominant amongst the surveyed group.

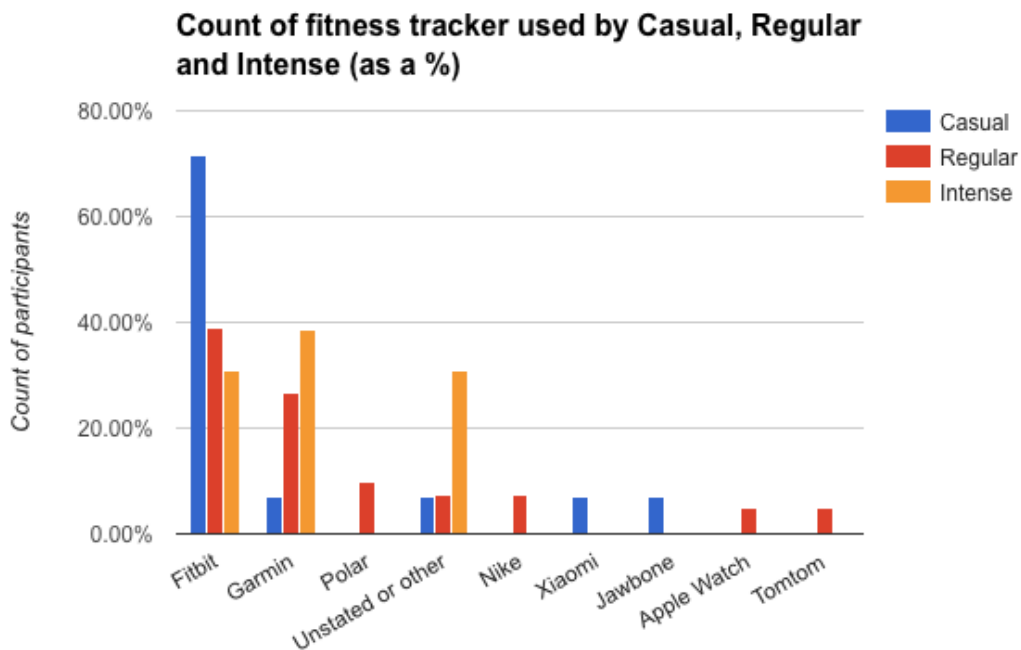


Figure 3. Distribution of fitness trackers used by 'casual' frequency (14 participants), 'regular' frequency (41 participants) and 'intense' frequency (13 participants).

The groups categorised indicated some parallels between workout frequency and a certain device (Figure 3). Those categorised with a 'Casual' attitude to working out showed clear preference for Fitbit devices, with the same trend evident with those committed to a 'Regular' workout schedule. Garmin popularity comes to play by being used by 'Regular' participants, notably rivalling Fitbit's popularity as the scale of workout frequency increases. Amongst 'Intense' users, Garmin takes the lead above Fitbit and other third party devices.

While these are not definitive results of user habits, it does match the target profile of each vendor. It could alternatively be concluded that 'frequency' is not indicative of how vigorous a person's training regime is across a weekly schedule when taking exertion and recovery into account.

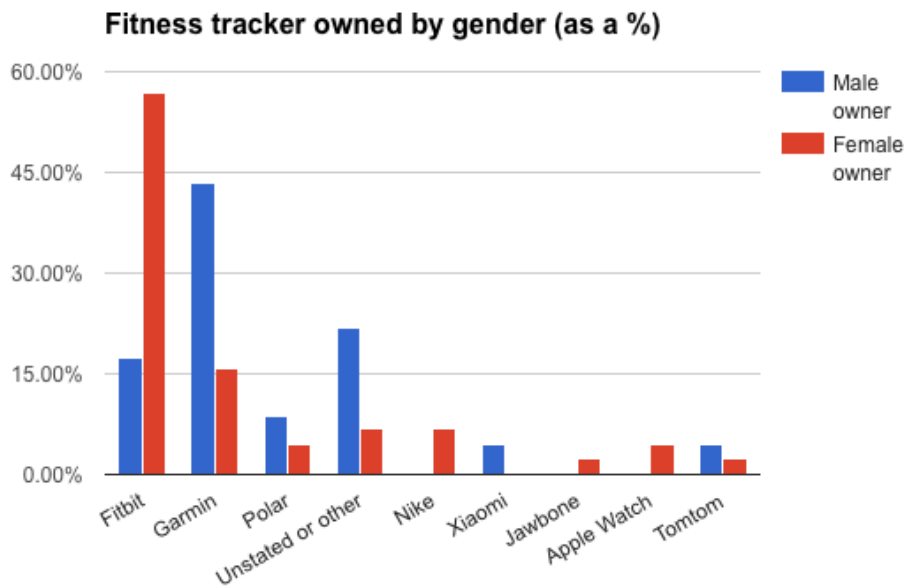


Figure 4. Percentage of fitness trackers used by Male participants (23 participants) & Female participants (44 participants)

Male & female participants correspondingly showed a preference for particular fitness trackers. Fitbit devices again ran clear favourite amongst females (Figure 4). The dominant presence of Fitbit in a commercial sense may account for its popularity with women as it offers a variety of general features for tracking activity. In contrast though, it would appear that male participants show an inclination towards more specialised devices. Garmin appears to have the majority share along with unnamed devices, indicating a male indifference towards commercial popularity in favour of functionality first. Furthermore conclusions could be drawn that there is a connection between gender, activity frequency and particular devices (Figure 5).

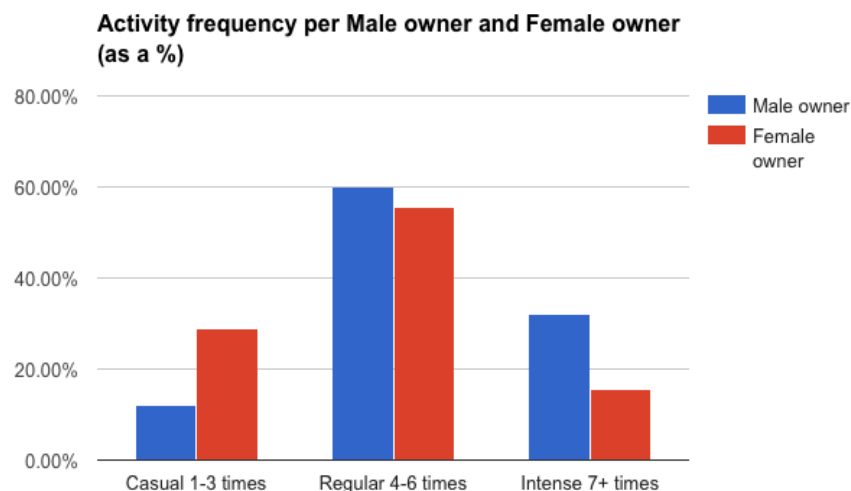


Figure 5. Percentage of activity frequency by Male participants (23 participants) & Female participants (44 participants)

### 3.3.2 INTENTIONS FOR UPTAKE

It is assumed that those opting to use a fitness tracker do so with the objective to track some aspect of their lives. Activity tracked varies between daily activity and acute tracking of defined periods of physical exertion (ie. Workouts and training).

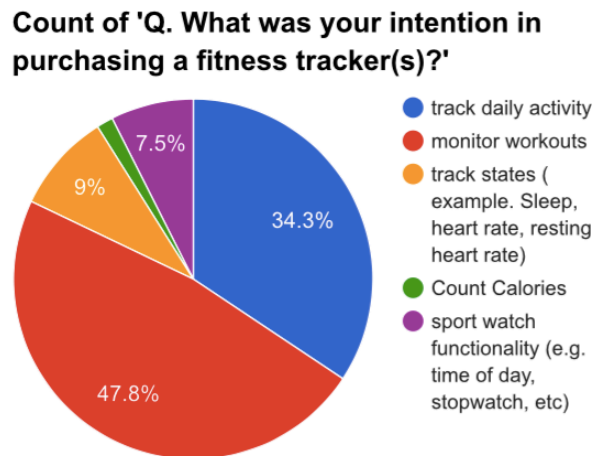


Figure 6. Count of (68 participants) intentions for using a fitness tracker(s)

Much in keeping with the trends illustrated in the opening chapters, the survey results highlighted the primary perceived uses of a fitness tracker as intended to quantify some form of activity, both general and defined. The intentions to 'track daily activity' or 'monitor workouts' far outweigh the other uses offered by the devices. Those activities dominate the variety of uses therefore proving people are indeed using fitness trackers as intended.

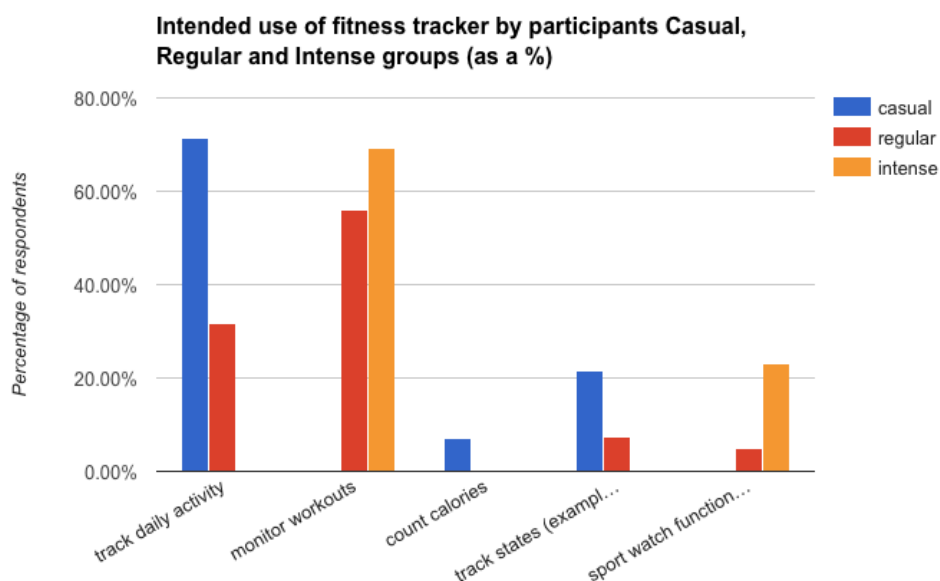


Figure 7. Percentage comparison of intended use across 'casual' frequency (14 participants), 'regular' frequency (41 participants) and 'intense' frequency (13 participants).



A trend is correspondingly seen when considered between the Casual, Regular and Intense groups too in terms of their intended use (Figure 7). The attitude amongst 'Casual' users fits the broad intention of tracking daily activity. Alongside tracking activity, 'Regular' users tend to further adopt the specific functionality of monitoring workouts. Those categorised as 'Intense' users distinctly show a precise intention to monitor their workouts while similarly utilising the sportswatch capabilities for timing activities.

This distinction of intention between users of a casual and concentrated attitude again fits the characteristics particular device owners appear to show. In keeping with analysing the two biggest players in the market, the same traits of Fitbit and Garmin users contrast one another when their initial intentions are compared and correlated.

While this is a relatively small sample size, the survey results show it is still obvious that Fitbit's dominance in the wearables market easily appeals to those eager to find some means to track activity and therefore have opted to integrate a fitness tracker into their daily lives (Figure 8). Those with the primary intention to 'track daily activity' appeared to favour Fitbit devices by indicating a more generalised reason for adopting a fitness tracker, much in keeping with how the product is marketed.

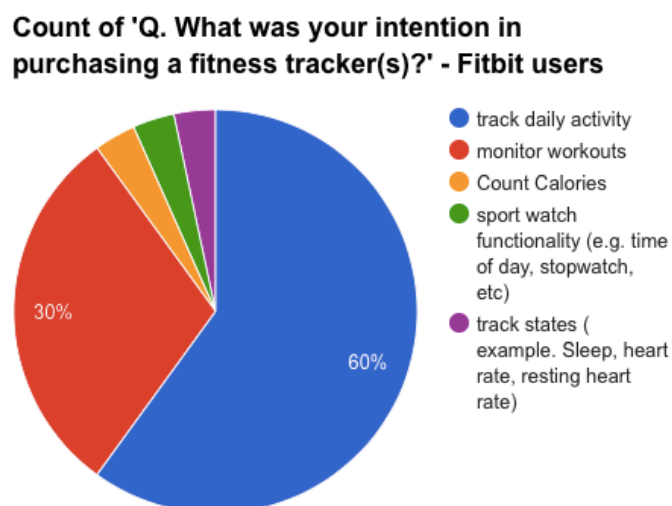


Figure 8. Percentage of Fitbit users (30 total) 'intention in purchasing a fitness tracker(s)'

Conclusions regarding Fitbit devices indicate that most 'Casual' people bought a Fitbit to track activity, and regardless of the additional functionality, they are only really interested in doing just that.

Meanwhile in comparison, Garmin users starkly registered a more specific intention to 'monitor workouts' and utilise the sports functionality of the product (Figure 9). Their focus was emphatically exercise based with all Garmin users answering 'YES' when furthermore asked "Do you deliberately track any specific activities? (eg. actively choosing to time the duration of a certain activity with your fitness tracker)".

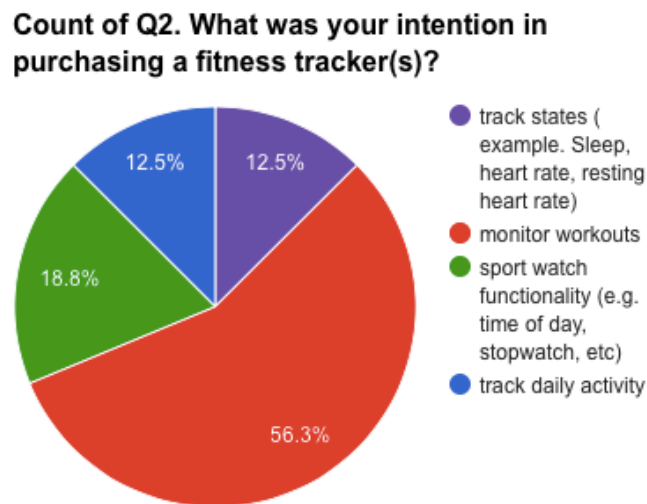


Figure 9. Count of Garmin users (17 total) 'intention in purchasing a fitness tracker(s)'

These results show how the activity behavior of some people may indeed significantly determine which fitness tracker they opt to adopt. Users appear to make this decision based on whether their purchase is of casual convenience or if their needs and interests do require a specifically suitable device.

### 3.3.3 INTENTION AND EXPECTATION VERSUS REAL OUTCOME

Despite the small sample size of participants involved, the comparison of intentions and actual use of those participants who had opted to forfeit using a fitness tracker still brought up some notable trends. For the 56 participants who were in the group of current fitness tracker users, a similar procedure to categorise their original intention and following use was applied.

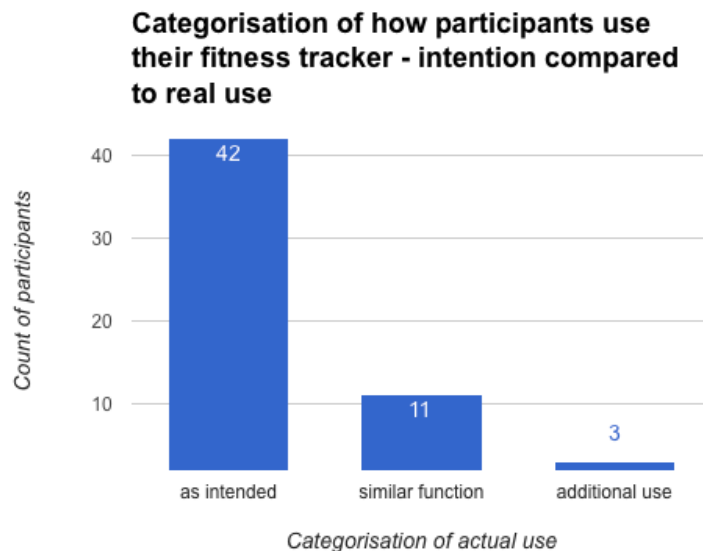


Figure 10. Comparison of initial expectation and actual use in which current users (56 participants) utilise their fitness trackers.

This analysis categorised the results from the perspective of whether a participant believed they were indeed using their device as initially intended or whether they had instead adopted a similar or other use the device offered. As expected, people indicated that they are using their devices how they originally intended, therefore implying that people are making informed purchases.

93% of participants who bought devices for specifically logging said they do log activities as intended. Interestingly, of those who had stated 'logging workouts' as both their primary intention and use, two respondents conflictingly answered that they do not log any activities. Their later answers gave no conclusive reason for this deviation, but one could speculate there may exist differences between a person's perception and actuality.

**Count of how participants are using their fitness trackers within the last year**

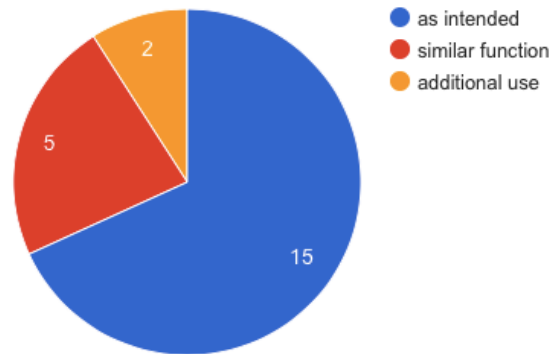


Figure 11. Categorised use trend of fitness tracker owners within one year of use (22 respondents)

**Count of how participants are using their fitness trackers after a year**

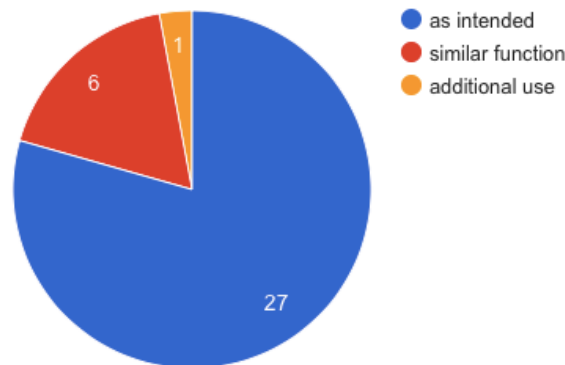


Figure 12. Categorised use trend of fitness tracker owners after one year of use (34 respondents)

The time scale of ownership does not appear to have had much impact in changing how a user uses their device. In comparing the categorisation of use between participants within a year and over a year, their original intention remains for the majority their most prominent use (Figure 11). Within the first year people may find additional use to what their device offers, after a year that is more unlikely (Figure 12). Regardless, the primary intended use is still the most dominant aspect and this would indicate the fitness trackers deliver on the grounds they are purchased for. It can similarly be said that people owning a device over a prolonged period of time are inclined to use it as intended, or else they may feel some reason to discontinue using them.

### 3.3.4 MOTIVATIONAL USE

The hypothesis of this research paper believes that fitness trackers offer more than just objective tracking statistics. Fitness tracking devices encourage users to be more active based on their subjective perception of the numbers they are presented with – motivation comes from objective goals as a result.

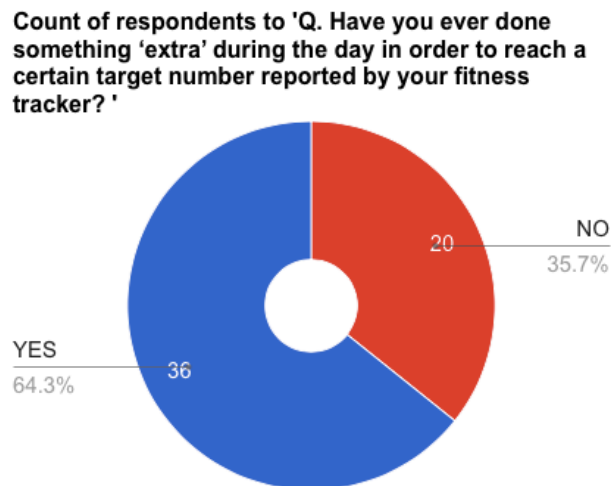


Figure 13. Count of (56 participants) in response to statement.

The majority of respondents indicated that they do actively make an effort to do some form of additional activity in order to improve the statistics registered by their tracker (Figure 13). A conclusion drawn from this implies that fitness trackers indeed offer an external form of motivation to users. Participants were given the option to add a description of what additional activity they do; the following results were coded to illustrate what motivations were in play, in relation to fitness tracker statistics (Figure 14).

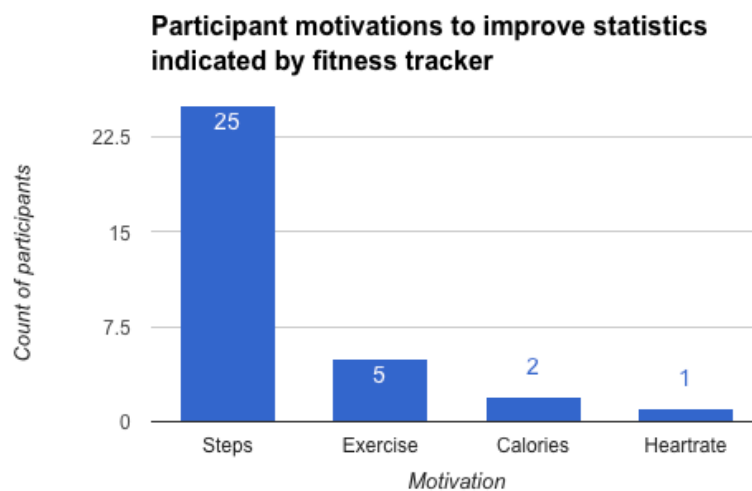
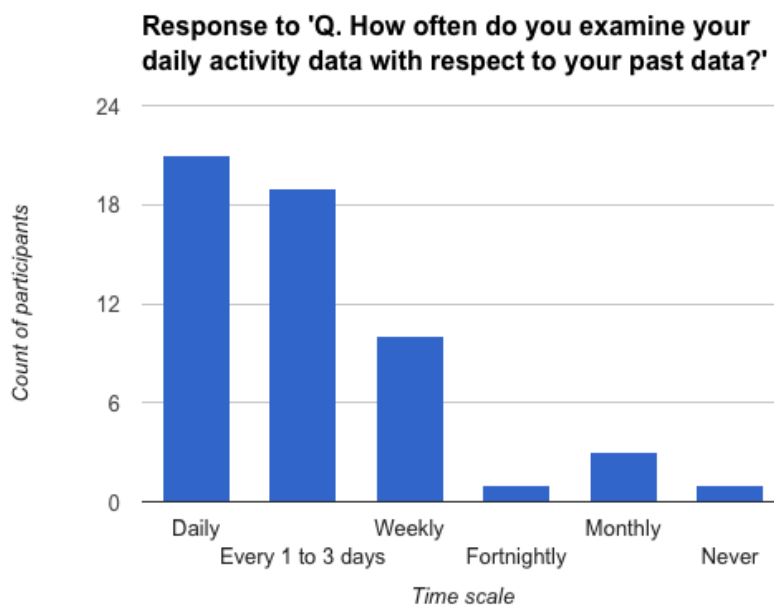


Figure 14. Count of (33 participants) in coded free-text response to previous question.

The activities involving 'Steps', as per *Figure 14*, saw participants frequently state 'to reach my 10,000 steps per day [they] have walked around and gone up and down stairs to make up the step count' or 'try do more steps than yesterday'. In the case of 'Exercise', participants commented they would increase their physical activity to 'include an additional and unplanned workout in the daily routine'. In a similar theme, those categorised as motivated by 'Calories' said they would engage in 'more activity to burn more calories' or for 'Heart rate' they 'pushed harder if heart rate was not high in workouts'. In all cases, a change in behavioural activity was made in response to objective figures indicated by their devices.

Conclusions drawn from this indicate that setting and meeting goals creates motivation. This motivation is therefore generated by goals tied into the objective measurement offered by fitness trackers. Immediacy of behaviour and a person's goals are two aspects that determine the effectiveness.



*Figure 15. Count of (56 participants) response to statement.*

How regularly users engage with their devices beyond the constant figure presented on their wrist was considered to see if frequency resulted in more connection or commitment to their device. When asked how often they synchronise and compare their tracked statistics, a majority did so regularly on a daily basis to within a week of use (*Figure 15*). Decisive conclusions could not be drawn as to whether frequent comparison of data either encouraged users to move more or if it resulted in users feeling bored. Responses regarding both were evenly shared when indicating time.

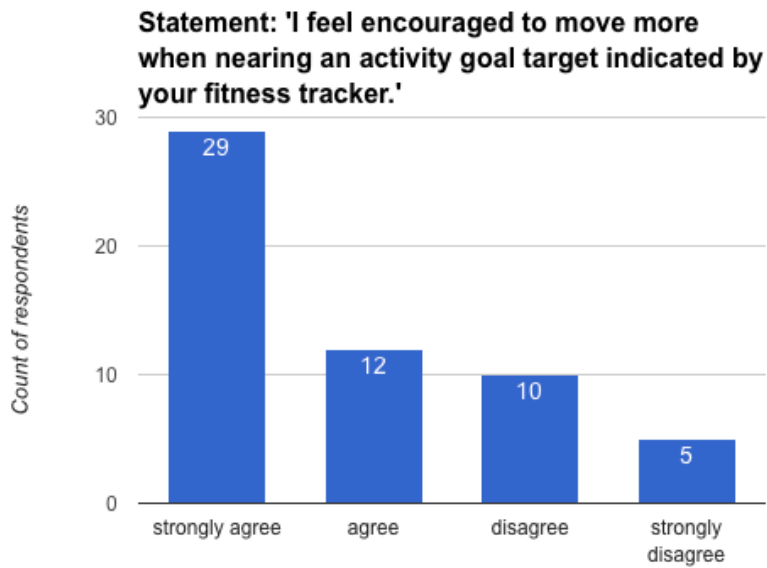


Figure 16. Count of (56 participants) response to statement.

When asked to indicate on a Likert scale, the participants as a whole showed that they did alter their activity or behaviour in response to tracked statistics of their devices (Figure 16). Participants were asked to rate the following statements whether 'I actively change my behaviour to improve my tracked activity indicated by my fitness tracker' (blue) and 'I have changed my goals as a result of tracking my activities' (red) (Figure 17). The context of the goal-orientated question does give clarity on the term 'goals' – participants may alter objective 'goals' indicated by their tracker or more broader lifestyle goals. Results do not reveal how but they nonetheless confirm fitness trackers as motivational tools to promote users into making active changes.

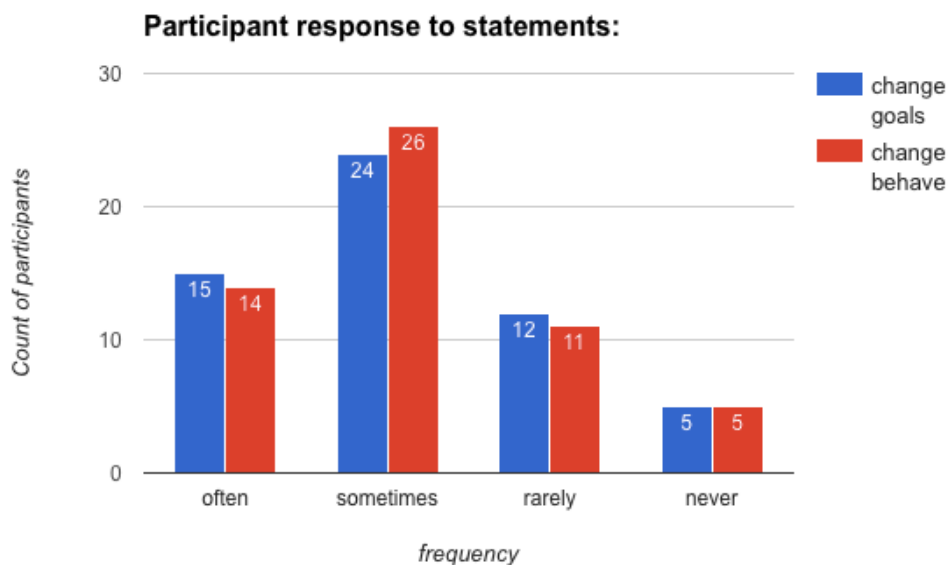


Figure 17. Count of (56 participants) response to statements.

**Response to 'Q4a. When comparing past data, were you likely to change or increase your goals in some way indicated by your fitness tracker?'**

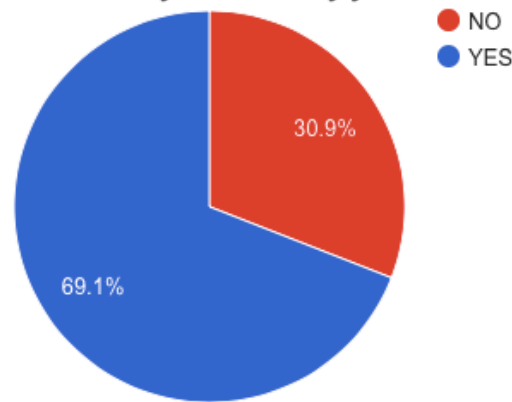


Figure 18. Count of (56 participants) response to question.

More than half of the respondents recorded that they feel strongly encouraged to move by their fitness tracker stats. It is worth noting in relation to a previous result – those who answered that they feel ‘encouraged’ and ‘strongly encouraged’ to move did not necessarily do anything ‘active’ as a result. A majority of those respondents however did feel that they had changed their behaviour due to their tracking habits (Figure 17.) – whether this is on a daily basis or over a long period of time is indiscernible from the data gathered. Similarly, results show that participants do more often than not change their goals as tracked, showing an awareness of the objective statistics their devices track (Figure 18).

**Count of 'encouraged' and 'strongly encouraged' participants when asked do they partake in additional activity to reach statistics indicated by their fitness tracker:**

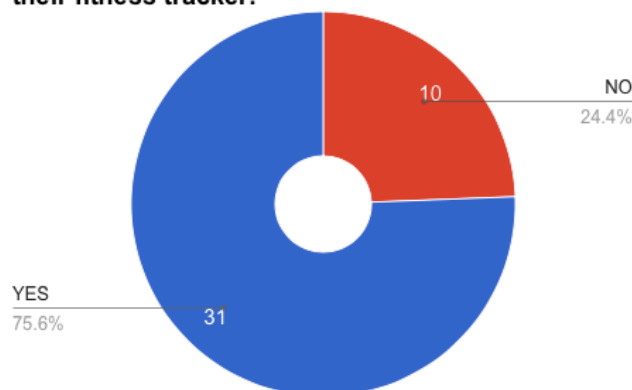


Figure 19. Comparison of data analysing whether participants (41 participants) who stated they felt ‘encouraged’ or ‘strongly encouraged’ by their fitness tracker partake in additional activity to reach statistics.



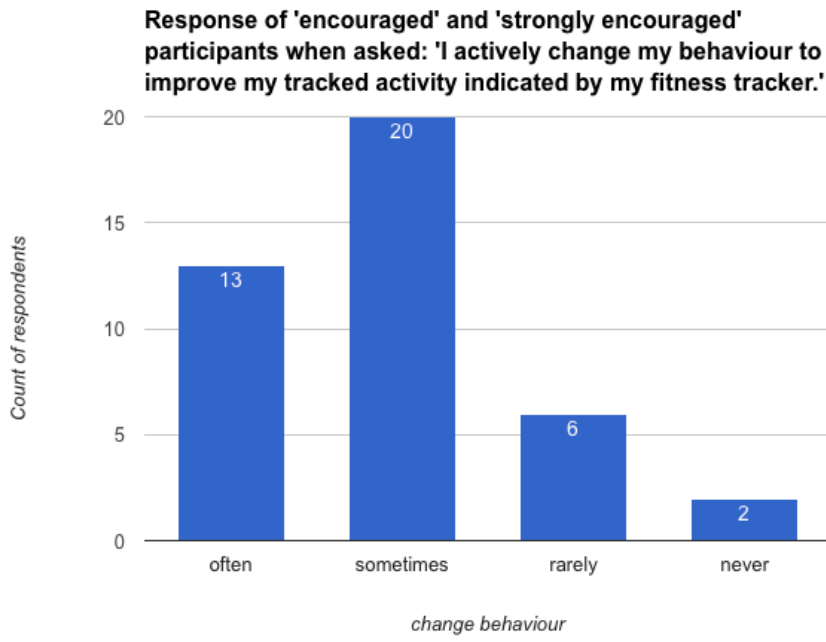


Figure 20. Comparison of data analysing whether 'encouraged' and 'strongly encouraged' to move participants (41 participants) indicated if they changed their behaviour.

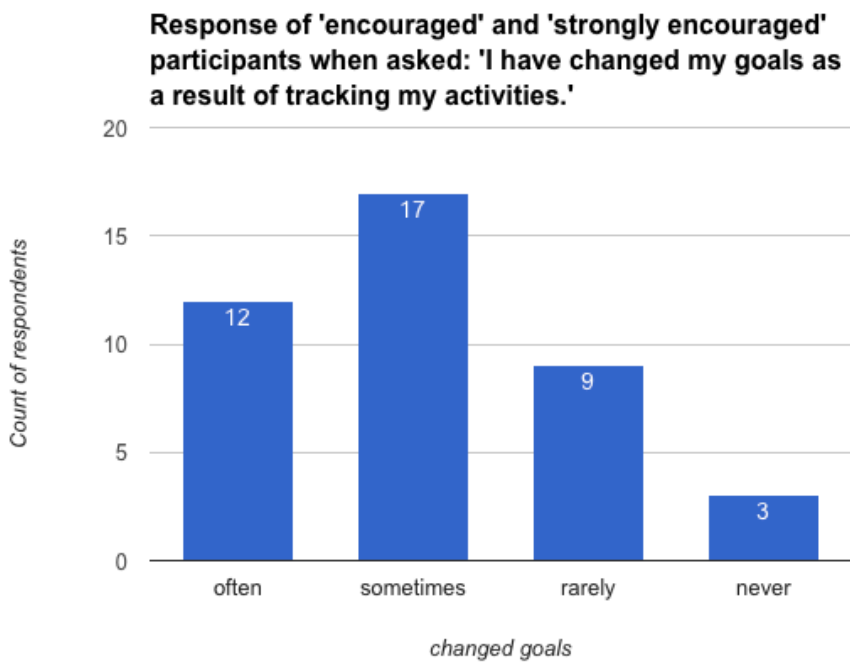


Figure 21. Comparison of data analysing whether 'encouraged' and 'strongly encouraged' participants (41 participants) indicated if they changed goals.

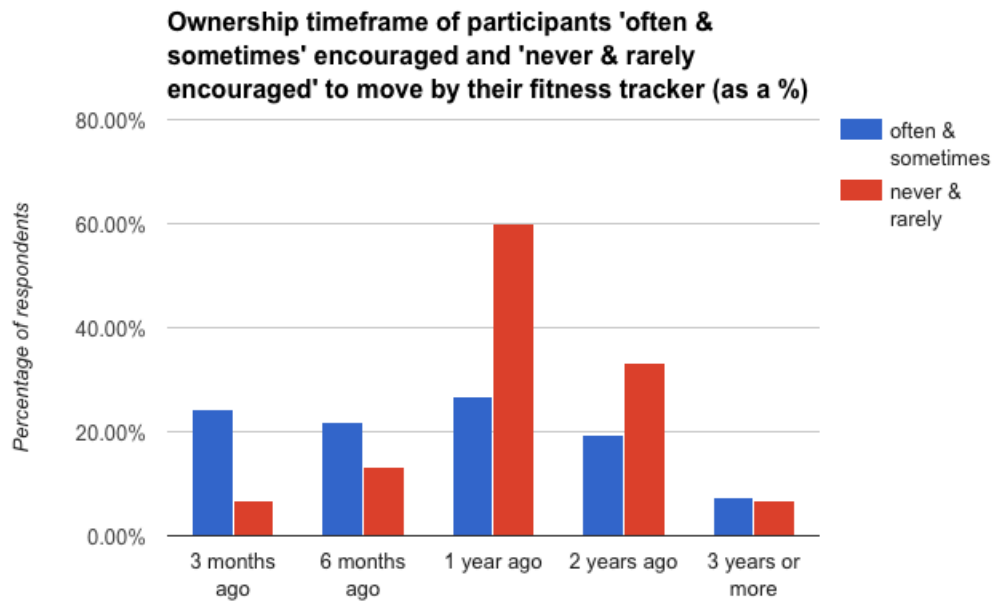
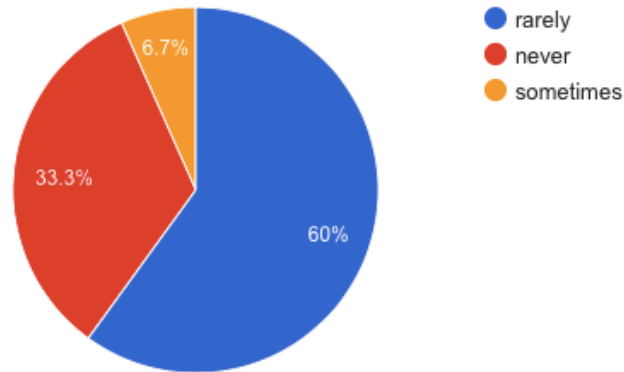


Figure 22. Ownership time of respondents who felt encouraged (41 often & sometimes, 15 never & rarely) by their fitness tracker.

Central to this paper is to discern what aspects of fitness tracker actively motivate their users to move. Analysis of results considered time and ownership period holding influence. A comparison of timeframe between encouraged respondents or those lacking encouragement shows a trend of feeling encouragement more so within the first year of use (Figure 22). In the first twelve months, motivation could be drawn from initial attachment or familiarity with the device fulfilling their health and fitness intentions.

The graph clearly shows a drop-off period after a year of which usage or lack of motivation may be the causes (Figure 22). In the case of those owning one within a year, there also appears to be a tail-off period of feeling motivational encouragement. Both instances prove that there seems to be some temporal effect that influences motivation in the usage of fitness trackers.

**Response of participants lacking encouragement to statement  
'I get bored from tracking the same statistics regularly.'**



*Figure 23. Response of participants (15) who lacked encouragement to move by their device*

The survey hypothesis anticipated that 'boredom' maybe marked as a reason for feeling a lack of encouragement to move from their fitness tracker. Interestingly though, of those who registered a lack of encouragement predominantly indicated they 'rarely' felt bored from 'tracking the same statistics regularly' (Figure 23).

### 3.3.5 REASONS FOR DISCONTINUED USE OF A FITNESS TRACKER

Though the use of fitness trackers presently remains strong, concerns regarding the retention of users and the life of the devices are interesting. The survey was designed to seek the experience of users both past and present to understand their reasons for using such devices. In the case of those who presently no longer use one, a substantial amount of time had been taken before they had discontinued use (Figure 24).

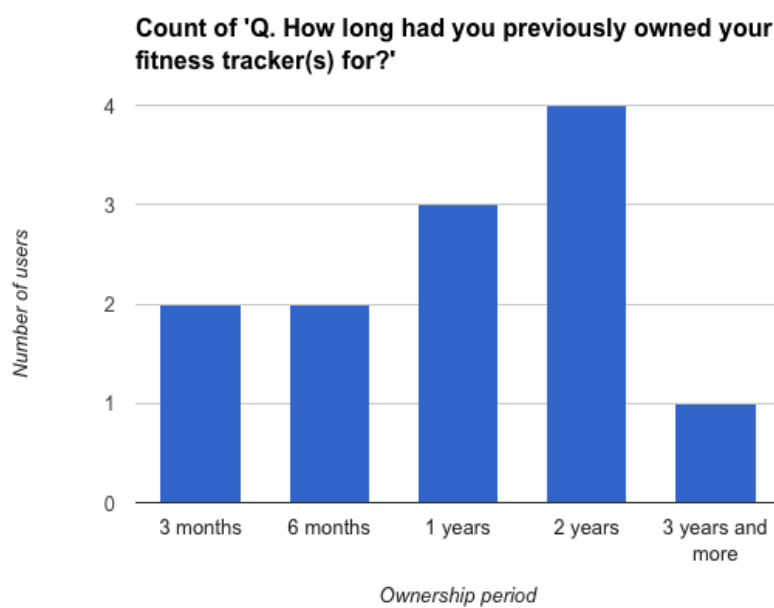


Figure 24. Time frame of fitness tracker ownership (12 participants) before discontinued use.

In this context of discontinued use, Fitbit devices were mostly named when asked which device they had owned. The results do not imply anything significant, with the respondents' reasons being varied and not indicative of any common issue. Proportionally speaking, the results perhaps only reflect the popularity of Fitbit in the first instance.

Furthermore, the survey design offered a selection of reasons on the assumption there would be a sample of participants who had discontinued use (Figure 25). Those who stopped using their device within their first year gave responses beyond the stated options. One noted that their device *'wasn't tracking exercise properly'*, an indication of dissatisfaction. Another added they *'no longer wanted to track [their] workouts so closely'*, which may allude to the psychological pressure of having every workout analysed. Those who gave up use after one year of ownership generally opted for reasons stated, though *'pregnancy'* was duly added.

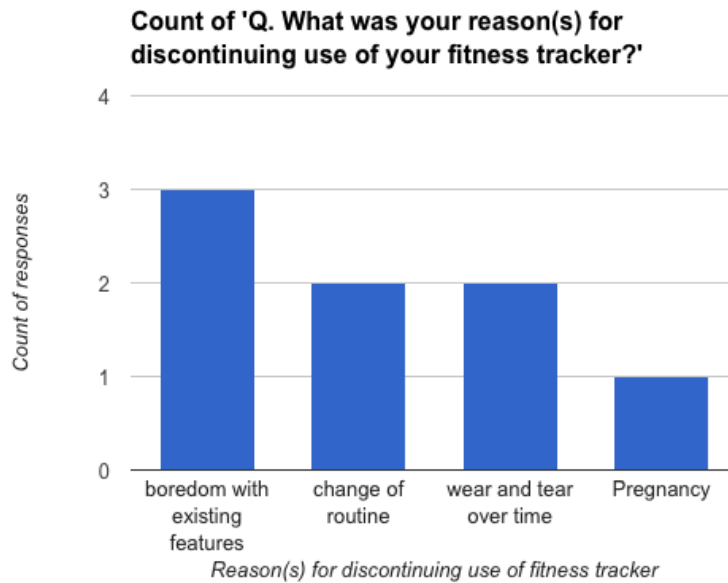


Figure 25. Reasons participants (8 total) no longer use their device after 1 year or more.

**Reason for discontinuation of use compared to initial intention for using fitness tracker:**

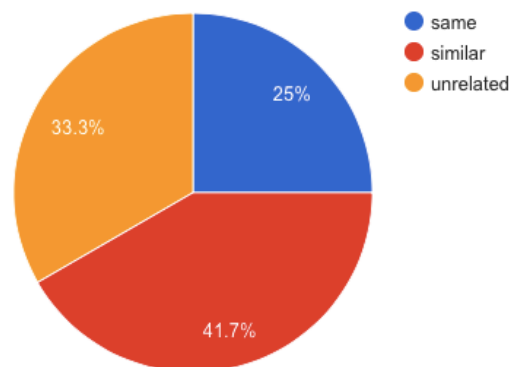


Figure 26. Expectation and outcome comparison of reasons for discontinued use of device.

Reasons for discontinued use were coded to compare relativity of expectation and outcome – responses were coded as ‘same’, ‘similar’ or ‘unrelated’. It was noted that only in a few cases did the reason reflect poorly on their initial expectations of the device – eg. Intention: ‘monitor workouts’, reason for discontinuation: ‘Wasn't tracking exercise properly’. In those instances some form of dissatisfaction or the device failing to meet its expected purpose were pointed out. In ‘similar’ cases, participants appeared to change their mind in how they intended to use the device. For example the presumption of ‘tracking daily activity’ wore off with a ‘change of routine’, or the intention to ‘monitor workouts’ resulted in ‘boredom with existing features’. The sample was too small to draw any decisive conclusions but results insinuate that themes are more likely external than to do with the device directly.

### 3.3.6 COMPETITION OR SHARING AS ADDITIONAL MOTIVATION

The survey results backed the hypothesis that more competitive or sports-specific users tend to favour Garmin devices. Results have shown that motivation created by fitness trackers is happening. When analysing the data (10 participants), those who answered they 'strongly agree' to the statement 'I enjoy the competition element of seeing other people being more active' were mostly Garmin users (Figure 27). However, that statement does not discount somewhat competitive participants as solely being Garmin users. Participants with some interest in competitive comparisons of tracked stats tended to own Fitbits – this aspect could be credited to the community based sharing that their fitness trackers offer (Figure 27).

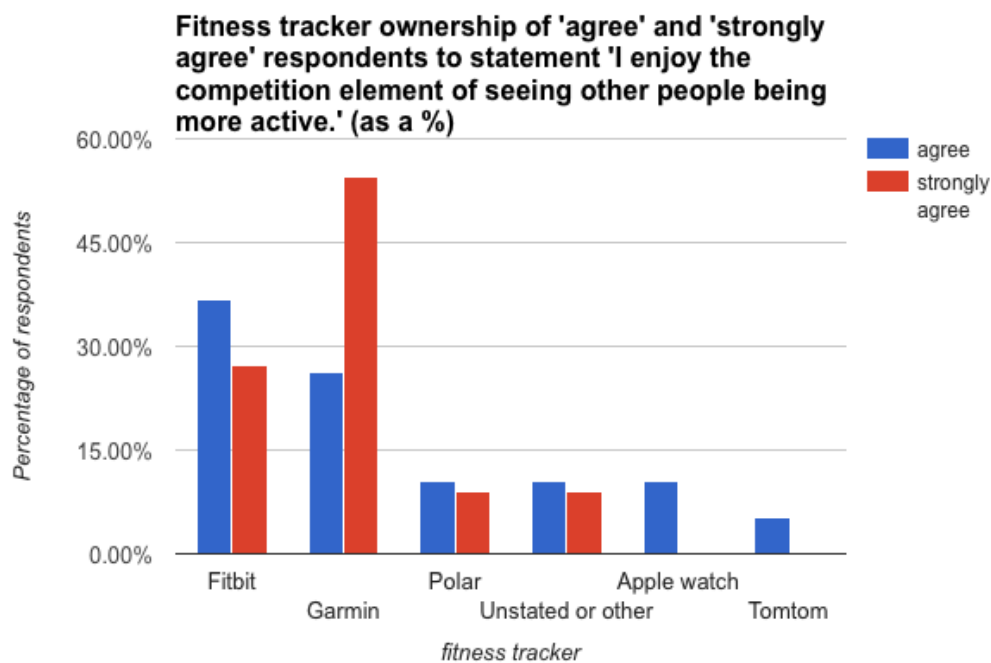


Figure 27. Percentage of devices owned by (19 participants) who answered they 'agree' and (10 participants) who answered they 'strongly agree' to statement

The survey asked whether participants compare or share their statistics and how in order to gauge whether doing so added to motivational aspects of fitness trackers. In response to the question 'Do you regularly share the data in an ad-hoc way with friends and family (i.e. by comparing results on a casual basis)', responses were nearly split down the middle (Fig. 28).

**Response to 'Q1. Do you regularly share the data in an ad-hoc way with friends and family (i.e. by comparing results on a casual basis)'**

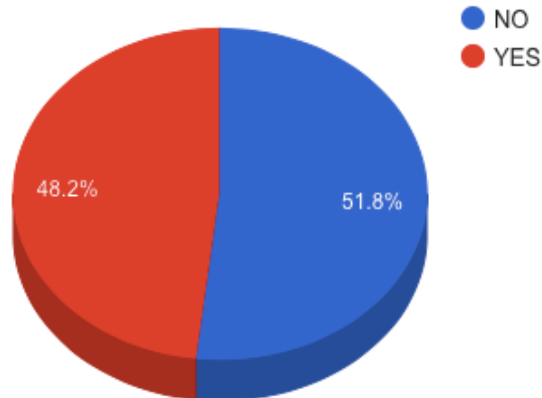


Figure 28. Count of (56 participants) response to question.

When it came to devices participants use to compare data, Fitbit and Garmin devices topped those owned (Figure 29). That was similarly the case for those who do not share their statistics due to the proportion of ownership. Sharing and not sharing data line up with other trends seen in device ownership cases. The reasons for users not sharing data may be down to their own private preference or alternatively how they view sharing through the devices functionality.

**Fitness Tracker owned by participants who 'Do share' and 'Do not share' data (as a %)**

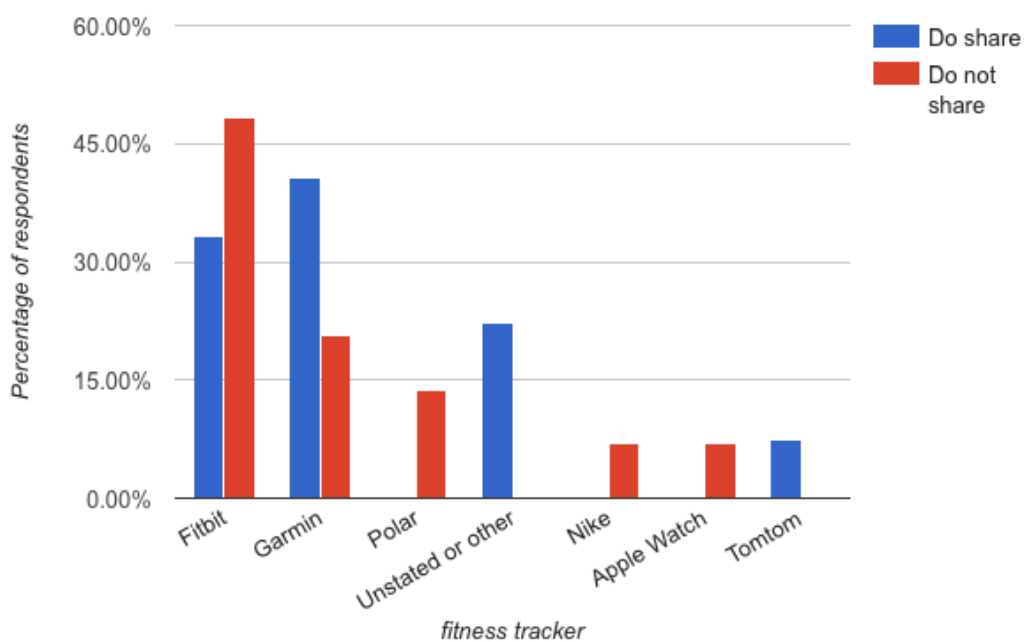


Figure 29. Fitness Tracker count of 'YES' participants (27 total) & 'NO' participants (29 total) response to sharing.

Of the reasons given for not engaging in sharing, results made clear that most 'NO' responders felt that no additional motivation would result (Figure 30). Privacy was secondary amongst respondents – it is plausible that users feel their statistics effectively only relate to themselves, or that they seek to maintain privacy of their personal data.

**Count of 'Q. What are your reasons for not sharing your data with others?'**

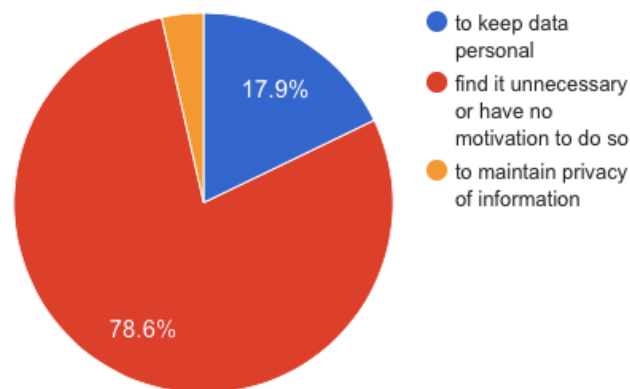


Figure 30. Count of reasons (29 participants) for not sharing data.

This research paper considers that fitness trackers offer more than just objective tracking statistics. Users being able to engage with other device users through sharing of their stats signify the community building prospects fitness trackers exhibit. As hypothesised, the results of the survey gave an insight into how users utilise their devices with others, casually or competitively, to further motivate themselves. Conclusively 'competitively' classed users who prefer structured contrast those 'casual' users – there is no real cross over in how they share data.

**Response to 'Q. How do you compare your statistics or activities with others?'**

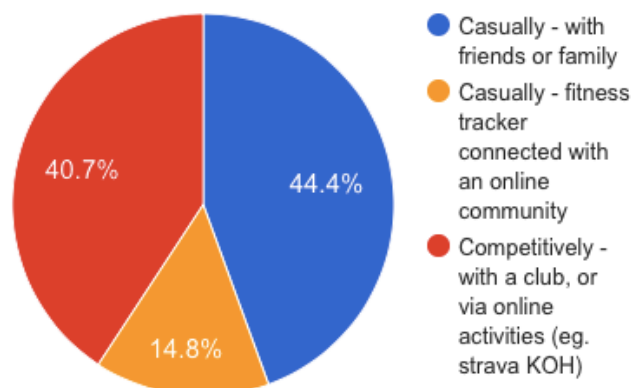


Figure 31. Count of how users (27 participants) categorise their sharing habits.



The continued trend of Garmin users being more competitively driven when it comes to using their devices was again evident when analysing the sharing responses. In distinct contrast, Fitbit users tended to classify their sharing habits as 'casual'. A clear division between the characteristics of Fitbit and Garmin users is once again proven (Figure 32).

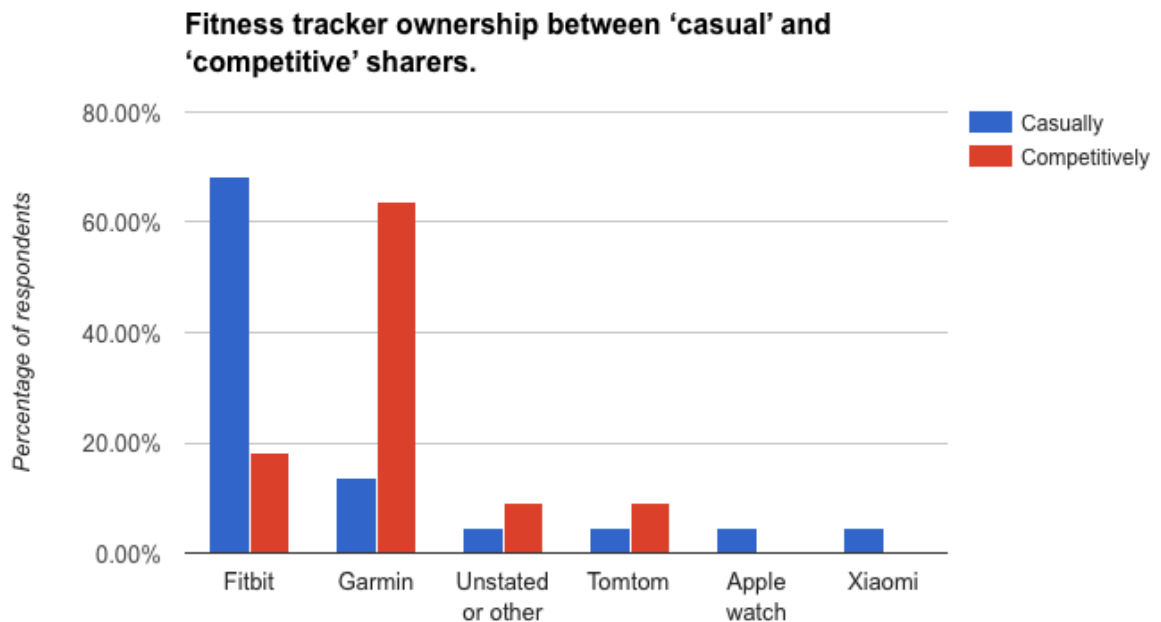


Figure 32. Fitness tracker comparison between 'casual' and 'competitive' sharing of data (33 participants).

The results were additionally looked at to ascertain what other aspects were fuelling motivations by association with others. By sharing and using fitness tracker based statistics, participants registered feeling motivation and also community engagement by doing so (Figure 33). 'Cardiovascular training workouts' were the most popularly shared activity amongst those respondents with 58% of the 24 participants doing so.

### Responses to 'What are your reasons for sharing activity?'

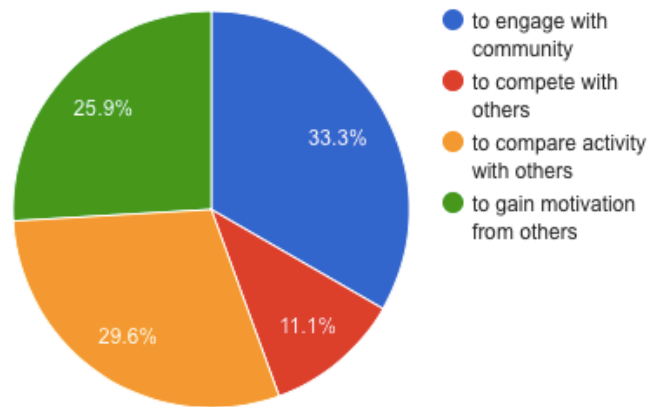


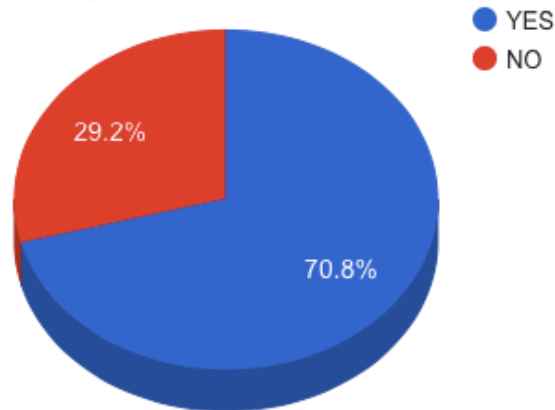
Figure 33. Reasons for sharing of data (27 participants).

The survey furthermore sought to see whether there were cases of people alternatively using a fitness tracker for more than just individual self-tracking. When asked 'Do you partake in any groups or challenges when connecting with others and sharing your tracked activity?' 8 participants stated 'YES' describing challenges involving step counts, distances covered or timed personal bests. The motivations derived in these cases are competition based with both a desire to top the charts and inversely the fear of failure driving respondents. While competition is seen as healthy, some respondents acknowledge that comparisons of such seemingly objective data are in fact circumstantial and subjective.

*'It can be good to use it as motivation to get out and exercise when you see your friends are doing it. It can be demoralising because you may think that you've had a good run/workout and then you see that your friends have run faster/further than you or worked out for longer than you.'*

*'Can motivate you to be more active to keep up with/do better than your friends. Makes you more accountable for and aware of your activity levels and how they are relative to your friends. However, if your friends are not very active, the fact that you're doing more activity than them can give you a false sense of security (just because you're doing more exercise than them doesn't mean you're doing enough)'*

**Count of 'Q. Have you noticed any significant differences in your activity from your engagement with others?'**



*Figure 34. Count of reasons (24 participants) in response to noticing differences in activity from engaging with others.*

The examples shown back the hypothesis that competition supports motivation. Motivation created on behalf of tracked statistics comes full circle with respondents for the most part reporting they notice 'significant differences' in activity by engaging with others. Objective figures and tracked statistics are reasons for people wanting to push themselves more. Perhaps the most compelling finding of this research was that of the 68 participants, one quarter noticed a 'significant difference' proving that engagement with others is motivational and a catalyst for positive improvement. It can therefore be concluded that fitness trackers are an example of tools that prompt and allow users to engage in additional activity.

### **3.4 FUTURE DEVELOPMENT**

Acknowledging the small sample size involved with the survey, it is hard to draw decisive conclusions regarding all the findings. Further research may seek to clarify several aspects and themes the results allude to.

The definition of 'goals' and the reaction of users to setting and meeting them could be re-investigated. 'Goals' if defined by numbers indicated by device could clarify the relationship between what statistics constitute improving behaviour. It could similarly seek to conclude if the effectiveness of reaching said 'goal' is a short-term or long-term change.

The temporal effect of owning a fitness tracker was seen to influence the amount of encouragement a user feels from engaging with their device. Additional examination into this area could give clarity into factors involved in both the tail-off of motivation and the drop-off rate of usage. Correspondingly, since 'boredom' or wear & tear of the device were not seen to be the definite causes of discontinuation, more insights could better inform how to maximise the future lifespan of fitness trackers.

Further investigation of these themes could strengthen knowledge around the effectiveness of fitness trackers in the promotion of physical activity and in daily life.

### 3.5 CONCLUSIONS

Analysis of the survey results referenced many themes discussed in the literature review of this research paper:

Firstly, user attitudes and objective intentions often determine the fitness tracker they may adopt. While many fitness trackers exist in the market and target certain audiences, the traits users possess very much reflect their use of certain devices. Evidently as seen in 3.3.1, the participant's attitude to engaging in activity first and foremost informs their purchase and usage. A clear reflection of the current fitness tracker market was evident between the different brands operating in the space through the participant response. The proportion of participants claiming to own a Fitbit device represented the dominance of the brand in the market.

Furthermore, by the observing the user attitudes and intentions in 3.3.2, the majority of Fitbit users demonstrated a more casual and general approach to tracking activity. In actual use as seen in 3.3.3, the incidental approach to tracking activity meant Fitbit trackers suitably support their workout frequency and lifestyle requirements. In contrast, the results consistently showed Garmin device users tended to be more focused and competitive users, mainly interested in tracking specific activities. Garmin users for most part had a clear intention and expectation towards the capabilities of the device they were using. Conclusively, people were seen to be using their devices how they had intended to do so upon purchasing them.

Secondly, the research showed how fitness trackers offer a variety of means from which a user can draw motivation. Objective tracking presented by the device allows users to gauge information and subsequently decide how to use it. While statistics may be objective quantities, the user's subjective view of them may prompt them to engage in additional activity. Section 3.3.4 provides examples of how users do find motivation to be active as a result. Despite feeling encouragement, a person may not necessarily partake in additional activity – a sense of motivation does not incentivise activity. In section 3.3.5 reasons for discontinued use were considered with external factors deemed more at fault than device flaws, conclusions however were not fully definitive given the small sample size.

For the vast majority of users though, it was shown that motivation is created through their relationship with the device by understanding their own personal feats and feeling encouragement to act as a result. Base statistics tracked by the device remained the same, but how a person interprets their output over any period of time and decides to act as a result is what drives active change.

Section 3.3.4 proved that motivation comes from feeling the ability to better something, in this case, statistics indicated by a fitness tracker – competition similarly plays a role as a reason for improvement, whether with your own self or with others. The discussion in 3.3.5 regarding competition additionally driving motivation found that 25% of participants noticed a ‘significant difference’ therefore proving that engagement with others is a catalyst for positive active improvement. People may make small active changes or long-term lifestyle behavioural changes as a result from interpreting a challenge posed by their fitness tracking and also from others using the same measurements.

In conclusion, current day fitness trackers are more than purely just objective tracking devices. Through this research they have demonstrated functionality way beyond that of singularly quantifying activity. Through their use they offer users the ability to generate motivation to be active, to encourage self-improvement, and support engagement with others – all of these factors support the drive towards healthier more active lifestyles. The advanced nature of technology allows fitness trackers to facilitate the objective needs potential users require, however it is the subjective benefits that make them valuable tools in every day life.

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## **APPENDIX – GOOGLE FORMS SURVEY**

### ***AN EXAMINATION INTO THE USAGE OF FITNESS TRACKERS BY THE GENERAL POPULATION.***

#### **RESEARCH OUTLINE**

You are invited to participate in this research project questionnaire. This questionnaire is to assess your experience, if any, of using a fitness tracking device(s) as part of your daily routine. The project is based in the School of Computer Science and Statistics, Trinity College Dublin, led by Caryn Chan and Glenn Strong.

For the purpose of this questionnaire, a ‘fitness tracker’ is defined as any wearable device to be worn on the wrist that is specifically designed to track and monitor a person’s movement, daily activities, and vital statistics in relation to health and fitness. (eg. Fitbit, Polar watch, Garmin, Samsung Gear, Nike Fuelband etc)

The outcome will help us understand the usage of fitness trackers and devices by members of the general public.

#### **RISKS AND DISCOMFORTS**

The survey is completely anonymous and will only take a couple of minutes to complete. Answering questions about one’s experiences may be uncomfortable.

#### **VOLUNTARY NATURE**

You can choose not to answer a question at any time. Each question is optional. Feel free to omit a response to any question; however we would be grateful if all questions are responded to. You may withdraw from the study at any time without penalty.

#### **CONFIDENTIALITY**

Please do not name third parties in any open text field of the questionnaire; any such replies will be anonymised.

We plan to analyse and publish the results of this study. Our report will not include any information that would identify you. To keep your information safe, we will move responses to a password-protected server and will only be maintained for duration of this project.

#### **CONFLICT OF INTEREST**

This review is being undertaken by Caryn Chan and Glenn Strong it is acknowledged that this represents a possible conflict of interest because:

- you may be a friend or acquaintance of us;
- you may be a student who studies with us;
- we work for/with an institution where you may study.

In respect of this acknowledgement, we ask that you act with integrity if you take part and we undertake to do the same as researchers. This research has been approved by the School of Computer Science and Statistics Ethics Committee, Trinity College Dublin.

## CONTACT

If you have any questions in relation to this, please do not hesitate to contact us.

Caryn Chan <[cachan@tcd.ie](mailto:cachan@tcd.ie)> and Glenn Strong <[Glenn.Strong@scss.tcd.ie](mailto:Glenn.Strong@scss.tcd.ie)>

Trinity College Dublin, School of Computer Science and Statistics.

## CONFIRM CONSENT

- I have read, or had read to me, the information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and I understand the description of the research that is being provided to me.
- I agree that any data I provide will be used for scientific purposes and I have no objection if this data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that if I, or anyone in my family, has a history of epilepsy then I am proceeding at my own risk.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I agree to Trinity College, University of Dublin storing and using the information I provide for this project.
- I am 18 years or older and am competent to provide consent

\* Required

**Q1. Confirm Consent - I have read, or had read to me, information about the project and know how information will be collected and stored. I understand that I can choose not to take part in this project at any time and for any reason I choose. Mark only one oval. \***

YES - I understand and would like to continue

NO - I would not like to continue

## GENERAL ABOUT YOU

Each question is optional. Feel free to omit a response to any question; however we would be grateful if all questions are responded to.

Q1. What is your gender?

Male

Female

Prefer not to say

Q2. What is your age range?

Over 18 and less than 30

30 and less than 55

55 and over

Q3. How many times a week would you set aside time to work out?

1-3 times

4-6 times

7+ times

#### **OWNERSHIP**

We would like to know a little more about whether you own or have owned a fitness tracker or any similar device(s).

Q1. Have you ever owned or purchased a fitness tracker(s)?

YES

NO

- *If 'NO' to Q1. Have you ever owned or purchased a fitness tracker(s)?*

#### **THANK YOU FOR YOUR PARTICIPATION**

For the purpose of this survey we are looking for participants who own or have owned a fitness tracker. Nonetheless we appreciate your time in volunteering to participate in this survey.

- *If 'YES' to Q1. Have you ever owned or purchased a fitness tracker(s)?*

#### **OWNERSHIP**

We would like to know a little more about your present or past experience you with using them.

Q1. Please state your fitness tracker(s)

Your answer: \_\_\_\_\_

Q2. What was your intention in purchasing a fitness tracker(s)?

track daily activity

monitor workouts

sport watch functionality (e.g. time of day, stopwatch, etc)

track states (example. Sleep, heart rate, resting heart rate)

Other:

Q3. Are you currently still using a fitness tracker(s)?

YES

NO

- *If 'YES' to Q3. Are you currently still using a fitness tracker(s)?:*

**PRESENT OWNERSHIP**

Q4. When did you purchase said fitness tracker(s)?

3 months ago

6 months ago

1 year ago

2 years ago

3 years or more

**PRESENT USAGE**

In this section we would like to hear about your experience of using a fitness tracker and/or devices. Specifically we would like to know about what kind of activities you use them for and how you engage with features they offer.

Q1. What would you consider your primary use of the fitness tracker(s) for?

logging daily activity

logging workout sessions

tracking sleep and/or other states

using time/watch functionality

Q2. Do you deliberately track any specific activities? (eg. actively choosing to time the duration of a certain activity with your fitness tracker.)

YES

NO

Q3. Have you ever done something 'extra' during the day in order to reach a certain target number reported by your fitness tracker?

YES

NO

Q3a. If 'YES' to the previous, please briefly describe some example.

Your answer

Q4. How often do you examine your daily activity data with respect to your past data?

Daily

Every 1 to 3 days

Weekly

Fortnightly

Monthly

Never

Q4a. When comparing past data, are you likely to change or increase your goals in some way indicated by your fitness tracker?

YES

NO

- If 'NO' to Q3. Are you currently still using a fitness tracker(s)?:

#### **PAST OWNERSHIP**

Q4. How long had you previously owned your fitness tracker(s) for?

3 months

6 months

1 year

2 years

3 years and more

Q5. What was your reason(s) for discontinuing use of your fitness tracker?

wear and tear over time

model discontinued or upgraded

too complex to use or understanding

boredom with existing features

change of routine

Other:

#### **PAST USAGE**

In this section we would like to hear about your experience of using a fitness tracker and/or devices. Specifically we would like to know about what kind of activities you used them for and how you engaged with features they offer.

Q1. What would you have considered your primary use of the fitness tracker(s) for?

logging daily activity

logging workout sessions

tracking sleep and/or other states

using time/watch functionality

Other:

Q2. Did you deliberately track any specific activities? (eg. actively choosing to time the duration of a certain activity with your fitness tracker.)

YES

NO

Q3. Had you ever done something 'extra' during the day in order to reach a certain target number reported by your fitness tracker?

YES

NO

Q4. How often did you examine your daily activity data with respect to your past data?

Daily

Every 1 to 3 days

Weekly

Fortnightly

Monthly

Never

Q4a. When comparing past data, were you likely to change or increase your goals in some way indicated by your fitness tracker?

YES

NO

### **SHARING**

In this section we would like to hear about how you may use or have used your fitness tracker for interacting and engaging purposes with others. We would like to know a little more about your motivations and experiences in doing so.

Q1. Do you regularly share the data in an ad-hoc way with friends and family (i.e. by comparing results on a casual basis)

YES

NO

- *If 'NO' to Q1. Do you regularly share the data in an ad-hoc way with friends and family (i.e. by comparing results on a casual basis):*

### **REASONS FOR NOT SHARING**

Q2. What are your reasons for not sharing your data with others?

to keep data personal

to maintain privacy of information

find it unnecessary or have no motivation to do so

had poor experience

Other:

- *If 'YES' to Q1. Do you regularly share the data in an ad-hoc way with friends and family (i.e. by comparing results on a casual basis):*

### **ACTIVE SHARING**

Q2. How do you compare your statistics or activities with others?

Casually - with friends or family

Casually - fitness tracker connected with an online community

Competitively - with a club, or via online activities (eg. strava KOH)

Q3a. Have you connected your device with others to share your activity?

YES

NO

Q3b. In answering part a), what are your reasons for doing so?

to compare activity with others

to compete with others

to engage with community

to gain motivation from others

Other:

Q4. What specific activities or data logged by your fitness tracker do you share with others?

General daily activity

Weight training workouts

Cardiovascular training workouts

Steps and/or distance covered per time

Sleep

Other:

Q5a. Do you partake in any groups or challenges when connecting with others and sharing your tracked activity?

YES

NO

Q5b. If 'YES' to the previous, please briefly describe some example.

Your answer: \_\_\_\_\_

Q6. Please briefly mention any benefits or drawbacks you feel come as a result of participating in such a manner:

Your answer: \_\_\_\_\_

Q7. Have you noticed any significant differences in your activity from your engagement with others?

YES

NO

### **PERCEPTION**

In this section we would like to know more about your opinion on the following statements about fitness trackers as pieces of technology and their role for health and fitness. Please indicate your opinion by marking one option with respect to your present or past ownership of a fitness tracker:

*I feel encouraged to move more when nearing an activity goal target indicated by your fitness tracker.*

1 – Often

2

3

4 – Never

*I enjoy the competition element of seeing other people being more active.*

1 – Often

2

3

4 – Never

*I actively change my behaviour to improve my tracked activity indicated by my fitness tracker.*

- 1 – Often
- 2
- 3
- 4 – Never

*I have changed my goals as a result of tracking my activities.*

- 1 – Often
- 2
- 3
- 4 – Never

*I get bored from tracking the same statistics regularly.*

- 1 – Often
- 2
- 3
- 4 – Never

#### **CONFIRM ANSWERS**

If you are happy with your answers, please confirm your consent for them to be recorded. You may instead wish to exit without submitting your answers.

Confirmation of answers

I am content with my answers and wish them to be recorded. Stop filling out this for

I am not happy with my answers and would like them to be disregarded - please exit without completing; your answers will not be stored.