

The relationship between personality, activity tracking, & preferences in performance feedback

by

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## **Abstract**

The transition into post-secondary education is difficult and involves increases in technology use and sedentary behaviours that can have adverse effects on health. Fortunately, the advent of activity tracking technology provides an opportunity to utilize college-aged individuals' affinity for technology to promote activity. Activity trackers provide users with feedback about their activity that can influence their behaviour or how they are perceived by others. Two studies were conducted examining the relationship between personality traits, activity feedback, and framing effects. Study One found that participants preferred goal-related feedback. In addition, Extraversion was related to finding the leaderboard most likely to influence one's activity. Study Two found that participants were able to form perceptions about a target's personality based solely on that target's activity feedback. When the feedback display indicated higher degrees of activity, participants perceived the target more positively for each of the Big Five traits apart from Agreeableness.

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## **The relationship between personality, activity tracking, and preferences in performance feedback**

The transition from high school into post-secondary education comes with a number of challenging life changes that play a significant role in the promotion, engagement, and maintenance of physical activity. While maintaining regular physical activity is an important factor in living a healthy lifestyle, a large number of people, college-aged individuals in particular, suffer from reductions in physical activity, increases in sedentary behaviour, and an increase in weight gain (Bray & Born, 2004). Additionally, the weight gained during the transition into post-secondary education seems to be related to individuals' reduction in physical activity behaviour rather than changes in their diet. The American College Health Association (2011) reported that only 9.6% of university students meet the recommended minimum requirements for physical activity (30 min of moderate activity, 5 times a week) and many individuals show a decline in physical activity from mid to late adolescence, with high school students exhibiting higher levels of activity than college-aged individuals (Nelson, Neumak-Stzalner, Hannan, Sirard, & Story, 2006; Hasse, Steptoe, Sallis, & Wardle, 2004). High school students have many opportunities to play on sports teams or clubs, which can provide them with regular opportunities to engage in physical activity with like-minded individuals. Unfortunately, this is not necessarily the case for college-aged students. Many high school athletes do not continue to participate in sports teams during college and thus spend less time being active, and more time engaged in sedentary behaviour (National College Athletic Association, 2013). Additionally, a number of the life changes during the transition into post-secondary education place significant stress on students and can hinder their ability to cope or manage their time. For example, a student attending a school outside their hometown may have difficulty transitioning

to post-secondary education due to a lack of social support or close social ties. This individual may then avoid certain situations that provide opportunities for activity because they do not wish to be compared with unfamiliar others (such as avoiding the gym). Time that would have been spent participating in physical activity may then be occupied with more sedentary behaviours such as watching T.V. or playing video games. In addition, the availability of activity related facilities also plays an important part in the activity levels of college students. For example, a school with a wide variety of activity related facilities and programs, such as a swimming pool, squash courts, sports clubs, etc., should have a more active student body than a school that lacks such facilities.

The transition to post-secondary education is a difficult one, and many students entering this period respond to the stressors with unhealthy patterns of behaviour (Nelson Laska, Pasch, Lust, Story & Edhinger, 2009). One common coping mechanism among college-students is excessive drinking behaviour (Perera, Torabi, & Kay, 2011). This particular coping mechanism may have a negative influence on individuals' activity levels. Those students who spend a large amount of time engaging in excessive or binge drinking behaviour also tend to participate in less physical activity than their peers who do not drink excessively (Correia, Benson, & Carey, 2005). In addition to excessive drinking behaviour, a number of other maladaptive behavioural patterns can contribute to inactivity in college-aged individuals. A lack of time-management skills and organization can lead to additional stress that can also contribute to an increase in sedentary behaviour. For example, students who are better able to manage their time and workload should have more free time available to be active, any may even set aside time for regular physical activity.

In addition to the problems associated with the transition to post-secondary education, there has been a proliferation in the number of technologies and programs aimed at making our lives easier or more enjoyable. Unfortunately, the growing use of these technologies in our everyday lives has contributed to a reduction in the amount of time spent engaging in physical activity (Lepp, Barkley, Sanders, Rebold, & Gates, 2013). Thus, a growing concern among the health care industry has become the drastic increase in the amount of time individuals spend participating in sedentary behaviours (Penedo & Dahn, 2005). The current document will focus on exploring the relationship between personality, activity feedback, and physical activity behaviour. More specifically, on how personality influences people's preferences for how activity feedback is presented, and how it may also influence people's actual activity behaviour.

Sedentary behaviour refers to activities which involve sitting or resting and that typically require very little energy to participate in or complete (Tremblay et al, 2012). A number of these sedentary behaviours, particularly time spent in front of a screen (such as sitting at a computer or playing video games), have been shown to have a wide variety of adverse effects on both physical health and mental well-being by replacing more active behaviours, thus contributing to a decrease in physical activity. For example, Hu (2003) found a positive relationship between sedentary behaviour and the risk for Type II Diabetes. In addition, they found that individuals whose days consist of a large amount of sedentary behaviour tend to be more likely to suffer from obesity, which itself is associated with a range of additional health concerns such as hypertension (Manson, Colditz, & Stamfer, 1990), metabolic syndrome (Park, Zhu, Palaniappan, Heshka, Carnethon, & Heymsfield, 2003), and heart disease (Eckel, 1997).

As the prevalence of sedentary behaviours continues to grow, it has become increasingly important to promote continued participation in physical activity. In fact, regular physical

activity has been linked to a number of health benefits and it is recommended that the average individual participates in at least a half-hour of moderate to intense physical activity daily (Kokkinos, 2012). Unfortunately a large majority of individuals do not achieve these minimum recommendations for physical activity due to our increasingly sedentary lifestyles (Brownson, Boehmer, & Luke, 2005). As noted earlier, college-aged individuals in particular have increasingly sedentary lifestyles, and thus miss out on a number of the health benefits associated with regular physical activity. For example, Myers et al. (2004) found that individuals who reported a significant increase in regular physical activity had a 20-35% reduction in risk of all-cause mortality and cardiovascular related death and has thus become an important tool in the primary prevention of disease and illness. Additionally, Erikssen (2001) also found that in a reduction in physical activity lead to an increase in an individual's risk of premature death due to all-cause or cardiovascular related mortality. Thus, it is not surprising that physical activity has been used in the primary prevention of illness, defined as preventing illness or other negative health outcomes through the promotion of physical activity. For example, Rosengren and Wilhelmsen (1997) found physical activity to be a protective factor against all-cause and coronary death. The benefits of regular activity do not stop with the primary prevention of illness, and has also been shown to benefit the secondary prevention of illness, by improving the course of a number of different chronic diseases such as obesity, diabetes, and arthritis (Brisson & Tudor-Locke, 2004). In other words, physical activity helped to alleviate some of the negative affects associate with these illnesses. Not only does regular physical activity help to promote and maintain physical and mental health, it also helps to reduce the strain on the economy by reducing the need for health services and preventing reductions in productivity (Colley, Garriguet, Janssen, Craig, Clarke, & Tremblay, 2011).

Prior research on sedentary behaviour and technology use has identified college-aged individuals as one particular at risk group (DeForche, Van Dyck, Deliens, & De Bourdeaudhuij, 2015). These individuals have grown up surrounded by technology, and thus many of them rely on it for their everyday social (social media such as Facebook, Twitter, etc.) and professional (Email to communicate with coworkers, online timetabling, etc.) interactions (Anderson & Raine, 2012). In addition, individuals in post-secondary education in particular are required to use a vast array of different technologies throughout their degree (Huffman & Huffman, 2011). In fact, technology use increases the further an individual gets into their degree, with graduate and upper-class undergraduate students spending more time using a computer or technology for educational purposes (Buckworth & Nigg, 2010).

Although these individuals' increased use of technology may put them at risk for increased sedentary behaviour, it has also resulted in them being relatively comfortable with new technologies (Anderson & Raine, 2012). This creates an interesting "double-edged sword" scenario, where these individuals' increased technology use puts them at risk for sedentary behaviour while also providing the potential to be more receptive to feedback that is presented in a technological format. Interventions could be designed to increase activity in this age group by capitalizing on how comfortable they are with technology. Fortunately, recent advances in activity tracking technology have provided researchers with a wide variety of tools for both measuring and promoting physical activity. College-aged individuals in particular are relatively comfortable and familiar with receiving a constant stream of information through technological devices and thus it seems likely that they would find utilizing and responding to feedback relatively easy compared to less technologically inclined age groups. Activity tracking technologies such as pedometers and accelerometers can be utilized to provide participants with

real-time, up-to-the-minute updates on their activity behaviour in a format that is easily accessible to them.

### **Activity Tracking Technology**

While the proliferation of technology has contributed to an increase in sedentary behaviour over the last decade, there have also been a wide variety of advances in activity tracking technology. These devices have been successfully utilized in past research to promote activity and reduce sedentary behaviour in physical activity interventions by making individuals more aware of their active behaviours (Rooney, Smalley, Larson, & Havens, 2003). In that study, when individuals were provided with the pedometer, they became more aware of their activity behaviour and took greater steps to increase their activity or to reduce sedentary behaviours. Similarly, De Cocker, De Bourdeaudhuij, Brown, and Cardon (2008) found that a pedometer-based physical activity intervention resulted in a significant increase in steps taken daily. In addition to promoting physical activity, this intervention had the added benefit of reducing the amount of sedentary behaviours individuals participated in as well.

Currently, there are a wide variety of activity tracking devices available to both researchers as well as the public. There are a number of different suppliers of these devices and each has a number of different “tiers” of trackers. For instance, most suppliers provide a casual device for the general public who are interested in their activity overall, as well as a “sport” or active device which is meant for monitoring moderate to intense physical activity, such as runs or workouts and is intended for athletes or highly active individuals. While both devices provide feedback on an individual’s activity such as steps taken, calories burned, or floors climbed, the sport trackers tend to be able to acquire additional data such as heart rate or GPS tracking. The idea here is that

the additional information provided by the sport trackers can allow users to monitor their activity more accurately, and then adjust their physical activity accordingly.

In addition to the data that is automatically recorded by activity trackers, such as steps taken or distance travelled, users are also able to input additional information which can help to improve the accuracy of tracking. For example, users of these devices can optionally input their height and weight, to allow for more accurate calculations of calories burned during workouts. Users can even log their food and caloric intake to gain a more accurate picture of their health and activity behaviour. Additionally, users can usually customize how their activity feedback is presented to them. Some services allow for a great degree of customization insofar that users can select which types of feedback is displayed to them, what is the most prominent on the feedback display, and make a number of customizations to the visual presentation of these metrics. Not only do these devices provide researchers with an opportunity to objectively measure activity, they also present a unique opportunity to promote physical activity. Users could utilize these devices to accurately monitor their activity in a format that is tailored to the individual so that they find it appealing. Providing unique and personal feedback using these devices could increase the user's engagement and motivation, with the goal of increasing both enjoyment and participation.

While Rooney et al. (2003) and De Cocker et al. (2008) showed that a simple pedometer could increase activity behaviour, Cadmus-Bertrem, Marcus, Patterson, Parker, and Morey (2015) found that using a more advanced form of tracking technology, a Fit-Bit™ activity monitoring bracelet, to provide feedback in a physical activity intervention actually increased the effectiveness of that intervention. Participants in the study were provided with either a Fit-Bit™ monitoring bracelet or a simple pedometer and were then asked to participate in about 150

minutes of moderate to vigorous activity a week and 10,000 steps a day. The participants who received the Fit-Bit™ had the advantage of being able to receive their feedback online via the Fit-Bit™ dashboard. It is interesting to note that the increase in activity shown in the Fit-Bit™ condition was above and beyond the benefits provided by the common pedometer with no online feedback. Thus, it was not simply the presence of the feedback that influenced participant's levels of physical activity, but how they received that feedback as well. Individuals may be differentially influenced by various kinds of feedback about their physical activity behaviour. This notion is in line with the literature on framing effects on decision making which also shows that how information is presented to individuals can influence their willingness to act upon it (Levin, Schneider, & Gaeth, 1998; Wiebenga & Fennis, 2014).

### **Performance Feedback & Framing Effects**

Past research on framing effects has identified a number of variables that influence individuals' decision-making process, and in certain cases, their behaviour as well. For example, a meta-analysis conducted by Levin, Schneider, and Gaeth (1998) identified three different framing effects that influence our decision-making and behaviour in unique ways. These three framing effects are known as risk framing, attribute framing, and goal framing.

Risk framing effects were first described by Tversky and Kahneman (1981). They were interested in whether participants' choices between a seemingly risky or riskless outcome could be influenced when the scenario was framed in either a positive or negative context. The study identified three issues that people faced when making decisions that involve framing or preferences. First, context is extremely important. That is, context and framing can influence how a situation or outcome is perceived which can in turn influence how an individual feels about that situation or outcome. A person could have different preferences or could make

different decisions depending on the context and how the situation is framed to the individual. Second, for the most part people are unaware of how strong of an influence framing can have on our decision making. Finally, in general people wish to not be influenced by framing effects, but are incapable or unable to do anything in order make decisions independent of these effects. Sometimes the framing of a scenario or decision can be quite obvious and other times it can be more subtle. In regards to health and activity behaviours, an example of a positive risk framing would be emphasizing the sure-fire health benefits associated with activity. Negative risk framing on the other hand would involve emphasizing the potential health risks of not participating in physical activity. Although this strategy can be effective with some health behaviours such as getting tested for prostate or breast cancer (Meryowitz & Chaiken, 1987), physical activity is a behaviour that needs to be repeated regularly in order to be effective, and for this reason attribute framing and goal framing may be more effective at promoting behaviour change.

Attribute Framing is different from risk framing in that instead of influencing individual's perceptions of the risks involved in making a decision, it influences how they perceive certain aspects or qualities about the outcomes or choices. In addition, it involves framing a feature of an outcome, whereas risk framing involves two different outcomes. In regards to activity, framing a goal positively could result in an individual feeling that they are more successful or capable and could result in them being more likely to engage in activity in the future. In addition, the method used to monitor activity is subject to attribute framing effects. That is, the same activity may seem more or less appealing depending on which attributes you choose to focus on. For example, when planning to go for a run, five kilometers may seem more physically demanding than running the equivalent number of steps, when in reality both runs are the same distance.

Similarly, while a run through the park may seem more enjoyable to some individuals, others may prefer to run inside on a treadmill instead.

Finally, Goal Framing also involves the use of positive vs. negative framing, but focuses on influencing individuals' behaviours as opposed to their perceptions. In positive goal framing, the aim is to promote a good behaviour or reduce a bad one. This is done by emphasizing the benefits associated with starting or continuing a good behaviour, or with quitting a bad one. For example, utilizing a positive goal framing technique to promote physical activity would involve informing participants of the benefits associated with physical activity in addition to the health issues avoided by staying active. Negative goal framing on the other hand would emphasize the health risks associated with inactivity and sedentary behaviour, as well as all of the benefits that participants are missing out on by not being active. Interestingly, past research by Meryowitz and Chaiken (1987) found that negative framing was more effective at influencing behaviour in regards to goal-framing. This outcome was attributed to a negativity bias in the way that individuals' process information, with people paying more attention to negative situations or stimuli. For this reason, negative framing may be effective at influencing intentional activity behaviour as opposed to promoting activity in general. Positive and negative framing are typically the two most common forms of activity promotion, and should play an important role in how individuals view feedback (Latimer, Brawley, & Bassett, 2010).

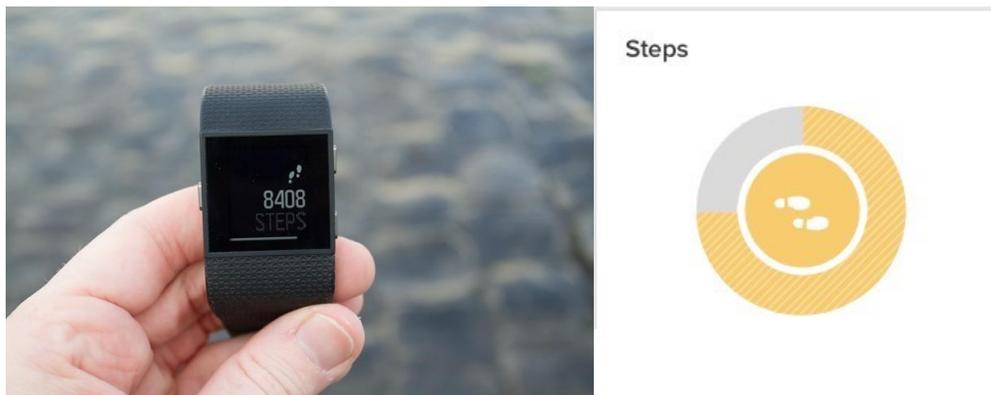
In addition to the framing effects identified by Levin et al., (1998), a study conducted by Choe, Lee, Munson, Pratt, and Kientz (2013) suggests three additional components that appear to have an influence on how people perceive and process information. These three framing effects involve components of the feedback itself and consist of the data unit, the distance to the goal, and the presentation type. Each of these components is explained in further detail below.

The data unit refers to the scale used to present the feedback to participants. Common examples of different data units include steps taken, pounds lost, or calories burned. Prior research by Ancker, Senithirajah, Kukafka, and Starren (2006) found that presenting feedback using different kinds of data units could influence how people perceived that feedback. According to Ancker et al. (2006), some types of data units are much easier for participants to understand and are more likely to lead to behaviour change. In regards to physical activity and activity trackers, the most commonly used measured data unit is step count. While step count does not distinguish between different kinds of physical activity, it does provide a good general measure of an individual's overall activity levels. In addition, it is relatively easy for individuals to understand that a higher step count indicates a higher degree of physical activity.

The distance to goal refers to how close (or far) an individual is to achieving a desired goal or outcome. In other words, it is the discrepancy between a goal and the individual's actual performance in achieving that goal. Past research by Schmidt and DeShon (2007) found that individuals were more likely to put effort into obtaining a goal or outcome when the distance to their goal was larger. They suggested that the greater the distance is between an individual's current performance and goal, the more likely that individual would be to prioritize that goal above others. Wiebenga and Fennis (2014) also found that individual's motivation to complete a goal was influenced by how they perceived the distance between their current state and their goal state. In the study, researchers primed participants to adopt either a "to-go" or "to-date" time perspective before being asked to complete a word-comparison task. Participants in the "to-go" condition were primed to focus on what they have left to complete until they reach their goal, while participants in the "to-date" condition were primed to focus on what they had completed thus far. Goal distance was found to have a mediating effect on the relationship between progress

framing and motivation, with individuals in the “to-date” condition indicating more motivation at the beginning of the task and individuals in the “to-go” conditions indicating being more motivated as they neared completion.

The presentation type refers to the medium by which the feedback is presented. Some different presentation types include images, text, progress bars, and audio prompts. Figure 1 depicts two different kinds of presentation types: step counts and progress bars. The medium in which feedback is presented can influence how appealing or important the individual finds that feedback and can even influence how they respond to it (Halvari, 1991). In addition, they found that this perception of goal distance can be influenced by an individual’s dispositional traits. For example, they found that success-oriented individuals who had a high future-time orientation were more likely to perceive the distance to their goal as shorter in addition to being more likely to plan and work towards their goal sooner than failure-oriented individuals with a low future-time orientation.



*Figure 1. Typical Feedback Presentation Types – The image on the left depicts a step count provided by a Fit-Bit Surge Activity Tracker. The image on the right depicts a typical progress bar from the Fit-Bit dashboard.*

Finally, some feedback displays allow for social comparison with others by placing leaderboards on the feedback screen. Typically these leaderboards would consist of friends, family, or other close associates of the individual, but can also be used to compare oneself to the

overall population. These leaderboards rank individuals based on certain aspects of their activity and allow for direct and simple social comparison. An example of an activity tracking leaderboard display is shown in Appendix G and was adapted from [www.fitbit.com](http://www.fitbit.com) (2015).

In a study conducted by Choe et al. (2013), participants were asked to imagine they bought a new activity tracker and that they had committed to a daily step-goal of 10,000 steps. Participants were then shown a feedback screen from their imaginary activity tracker. The researchers then manipulated a number of the framing components (valence, presentation type, distance to goal, and data unit) displayed to participants in order to examine their effects. Participants in the positive valence condition were shown steps achieved, whereas those in the negative valence condition were shown steps remaining until the goal. Choe et al. (2013) found a main effect of valence with individuals who were shown the positive valence condition reporting higher levels of self-efficacy. In addition, a main effect was found for presentation type with participants reporting higher self-efficacy when their feedback was presented in text only, as opposed to text with visuals. Finally, they also found an interaction effect between data units and distance to the goal. It appeared that when participants were either very close or very far from completing their goal, the effect of the data unit was actually increased. The framing of the feedback displays influenced participants' perceptions of their own personal abilities, and it is possible that it could influence their perceptions of other abilities or traits as well. Additionally, if the framing of our own feedback can influence how we feel about that feedback, is it possible that it could also influence our willingness to be active?

### **Personality and Physical Activity**

Given the links between physical activity and health, it is important to try to identify which people are more or less likely to take part in physical activity. Past research has identified a

number of personality traits that play a role in health by influencing individuals' likelihood to be active. In fact, Bruner, Augestad, and Gudmundsdottir (2013) found that individuals who reported having higher amount of leisure time physical activity (LTPA) also reported higher levels of Extraversion, whereas those who were less active reported higher levels of Neuroticism. A study conducted by Gallagher, Yancy, Denissen, and Kuhnel (2013) also found that individuals who were high in the specific traits of Activity and Discipline (which are similar to Extraversion and Conscientiousness) were more likely to have longer time spent participating in LTPA. The Big Five trait classification system (see John, Soto, & Naumann, 2008) is the most commonly employed taxonomy of personality traits, therefore I will be discussing how each of the five traits are related to activity engagement. Extraversion, Neuroticism, and Conscientiousness in particular have been reliably shown to be related to physical activity behaviour (Rhodes & Smith, 2006).

Extraverted individuals are high in energy and positive emotions, and tend to seek out situations that provide them with more opportunities to socialize with others (McCrae & John, 1992). According to Eysenck, Nias, and Cox (1982), the combination of high energy and sensation-seeking behaviour helps explain the relationship found between Extraversion and physical activity. In addition, sports teams are an environment that has the potential to provide extraverted individuals with opportunities to engage with and meet other people (Wilson & Dishman, 2014), which could also help explain the relationship between Extraversion and physical activity.

Conscientious individuals tend to be organized, dependable, and self-motivated (McCrae & John, 1992). These individuals tend to participate in higher levels of physical activity because they are better able to regulate their own behaviour, in addition to being more likely to adhere to

health related behaviours such as participating in regular physical activity. They have also been found to be more likely to persevere in the face of failure (Conner & Abraham, 2001). In addition, Conscientious individuals are also more likely to follow through with their intentions to engage in physical activity behaviour (Chatzisarantis & Hagger, 2008).

Neurotic individuals tend to experience more anxiety, rumination, and depression (McCrae & John, 1992). These individuals tend to suffer from high levels of social anxiety and self-consciousness that leads them to avoid situations where downward social comparison is a possibility. This can contribute to a reduction in their physical activity behaviour, as they are much less likely to engage in activity when in the presence of others. In some cases, these individuals' low sense of self-efficacy leads them to avoid physical activity altogether out of the belief that they are not capable of doing so (Wilson, Krueger, Bienias, Mendes De Leon, & Evans, 2005).

With respect to the final Big Five traits, individuals who are highly Agreeable tend to work cooperatively with others, in addition to being more trusting of others, while individuals who are high in Openness to Experience tend to be willing to try new things and maintain a sense of curiosity about the world around them (Costa & McCrae, 1992). Past research on Openness, Agreeableness and physical activity has resulted in mixed results. Wilson and Dishman (2014) found a small positive relationship between Openness to Experience and physical activity, which they attributed to the fact that individuals high in Openness tend to enjoy trying new activities which leads them to being more active. On the other hand, Rhodes and Smith (2006) found no relationship between Openness to Experience and physical activity. It is possible that individuals high in Openness are more likely to try other activities which may be unrelated to physical activity, and thus perform it less often. For Agreeableness, Rhodes and Smith (2006) and Wilson

and Dishman (2014) did not find a significant relationship between Agreeableness and activity, but Stephan, Sutin, and Terraciano (2014) found evidence for a positive relationship. Stephan et al. (2014) suggested that Agreeableness and physical activity may be related because participating in physical activity creates social interactions that lead individuals to maintain prosocial, agreeable behaviours.

Similar to how knowing one's personality can provide clues about that person's behaviours, knowing certain attributes about an individual can also provide us with information regarding their personality. That is, people appear to be able to make fairly accurate judgements about another person's personality based solely on static and/or dynamic information about that individual. For example, Naumann, Vazire, Rentfrew, and Gosling (2016) found that participants would make personality judgements about another person's personality based solely on aspects of that individual's physical appearance, such as the clothes they were wearing. It appeared that a person who was neatly dressed and well-groomed was considered to be more conscientious than an individual in old, dirty clothes. While these judgements tend to be fairly accurate when comparing perceived personality to self-reported personality, findings by Naumann et al., (2016) suggest that their accuracy is not tied to face-to-face interaction alone. Purely static clues seem to be able to provide individuals with a sufficient amount of information to make accurate personality judgements about another person's personality. In addition, past research also suggests that certain types of information or environments are better for predicting certain personality traits above others. For example, Gosling, Ko, Mannarelli and Morris (2002) found that participants made more accurate judgements about a target's level of Openness when they were shown the target's bedroom, but made more accurate judgements about Extraversion when shown the target's office. It could be that because there are restrictions on how a person can

decorate their office space (whether due to office regulations or in an attempt to maintain a professional image in the workplace) and there are less opportunities for self-expression, and thus less personal information available to utilize in making a personality judgement.

Additionally, the increased accuracy in judging Extraversion in office settings could be because office settings are typically more reserved, and any forms of self-expression may be considered extraverted.

It appears that individuals have the capability to make judgements about other people's personalities and it has thus become important for researchers to ask ourselves whether these judgements are more, less, or equally as accurate as self-reports. Vazire and Mehl (2008) aimed to answer this question by comparing three separate measures of personality. Researchers had participants rate themselves, choose three friends to rate them, and finally they had their behaviour monitored using an electronically activated recorder (EAR), a sound recording device that could be worn unobtrusively on one's person and could be activated remotely by the researchers. Their findings provided valuable insights into the accuracy of observer-reports of personality. They were able to compare the self and observer reports of personality to participants' actual behaviours (recorded on the EAR device), providing a behavioural criterion for measuring accuracy that is free of self or observer reports. In other words, a measure of personality would be considered accurate if it correlated with how a person actually behaves in their everyday life. First, participants believed that their ratings of themselves were the most accurate, and second, while participants believed themselves to be the most accurate, self and observer ratings were actually equally as accurate. Additionally, Vazire and Gosling (2004) found that while personality judgements based on personal websites were as accurate as judgements based on bedrooms or offices, people came about making these ratings in different

ways. Context appears to play an important role in how individuals perceive each other. More specifically, the degree of control the individual has over the context, and how public that context is can influence the amount and type of information that is available when perceiving others. Situations where an individual can have a great degree of control over how others perceive them should result in personality judgements that correlate more closely with that individual's ideal or optimal self. In addition, individuals are less likely to depict negative traits or aspects about themselves, and so making judgements about these traits may prove to be more difficult than positively viewed traits.

Vazire (2010) also found that self and observer reports can provide unique information, suggesting that there are certain qualities we are better at judging about ourselves than others. More specifically, they found that participants indicated that qualities of Extraversion were easier to perceive and identify in others than qualities of Neuroticism, because it is easier for individuals to notice behaviours indicative of personality traits. In regards to the previous example, it makes sense that Extraversion would be easier for participants to identify because it is a trait that involves the activation of behaviour as opposed to the inhibition of it. Extraverted individuals actively engage in sensation-seeking behaviour which tends to be very noticeable, whereas Neurotic individuals are more reserved and their behaviours less explicit. In other words, Extraverted behaviours are more public than Neurotic ones and thus be easier to recognize.

### Current Studies

In Study One, participants were asked to complete a survey on physical activity, personality, health and their preferences for particular types of performance feedback. Participants in Study Two were asked to complete the same survey that was used in Study One, but were not questioned about their feedback preferences. Instead, Study Two was primarily concerned with identifying whether participants would form perceptions about another person based solely on that person's physical activity feedback. In addition, Study Two also aimed to determine how goal progress and framing influence these perceptions. In both studies, role limitations due to physical health was measured using self-reports, as it has been shown to be related to physical activity, with individuals who are less physically able participating in less physical activity. Participants were then asked to complete a modified version of the MINI-IPIP that asked participants to respond to questions based on the information provided in the feedback display.

In Study One my primary goals were:

- 1) To identify which components of feedback people prefer and find important.
- 2) To determine whether personality traits influence an individual's preferences for certain kinds of performance feedback, as well as which components they find most important.
- 3) To determine whether any relationship between personality and feedback preferences holds when controlling for achievement seeking and perceived physical self-efficacy.

First, I expected to replicate past findings on personality and physical activity levels. I expect physical activity to be positively correlated with both Extraversion and Conscientiousness, and negatively correlated with Neuroticism. In addition, Openness to Experience and Agreeableness are expected to be unrelated to activity behaviour.

Second, it was expected that extraverted individuals would find the leaderboards to be the most important aspect of the feedback screen. These individuals strive for situations in which they can work or compare themselves with others (McCrae & John, 1992) and the leaderboard depicts the user's activity feedback alongside other user's, allowing users to make quick comparisons between their own feedback and other individual's.. Extraverts who see that their friends are more active could be motivated by the sense of competition, and thus increase their activity behaviour.

Third, it was expected that Conscientious individuals would be likely to find progress bars more important than step counts. Conscientious individuals are goal-oriented, and thus progress bars provide them with more information about their goals than step counts.

Finally, it was expected that Neurotic individuals would prefer leaderboards the least, and find them to be less important. Individuals high in Neuroticism do not enjoy being compared to others out of fear of embarrassment or ridicule and are more prone to self-conscious emotions in general (Wilson et al., 2005). These individuals may not find the leaderboards interesting or important because they do not wish to be compared to others and are aiming to avoid a negative social comparison.

Study Two sought to identify whether providing individuals with feedback about a target person's physical activity could influence how they perceived that target's personality. In other words, are personality and behaviour so intertwined that people form impressions about another individual's personality just by viewing their physical activity feedback? In a study by Gosling, Ko, Mannarelli and Morris (2002), observers were taken to an office building and asked to complete a set of personality ratings about the employees workspaces in the office, and these impressions were compared to the employees' self-ratings of personality. They found that

individuals formed impressions about the employee's personality based solely on the information provided by the employee's workspace, and more importantly they found these impressions to be fairly accurate.

In Study Two participants were shown four feedback screens in a randomized order and told to imagine that these displays represented another person's activity feedback, and were then instructed to respond to a survey which asked questions about the target's personality based solely on the feedback provided. First, it was expected that when participants were shown the high step count conditions, they would be more likely to indicate that the feedback came from an extraverted individual. Highly extraverted individuals tend to seek out stimulation and interactions with others, and step counts provide a broader measure of activity than do progress bars. Activity is considered a facet of Extraversion (McCrae & John, 1992) and thus should be connected with general overall activity. In addition, it may be the most effective to analyze the relationship between Extraversion and activity at the facet level for this reason. For example, Extraversion has a talkative facet and an activity facet. The activity facet should be more strongly related to physical activity behaviour, and would thus provide more information about a target's level of Extraversion than the talkative facet.

In addition, general activity (which is assessed by the activity tracker) may be more associated with Extraversion than specific activities because it is often difficult to pinpoint specific behavioural indicators for specific traits. High levels of steps should indicate a high degree of activity, and participants will perceive the target as higher in Extraversion.

Second, it was expected that when participants were shown the high progress bar conditions, they would be more likely to indicate that the feedback came from a Conscientious individual. Conscientious individuals are highly goal motivated and the progress bars provide

them with tangible information on how far or close they are to completing their goal. Thus, when individuals were shown the high progress conditions they should have believed that the feedback came from an individual who was highly motivated and organized. In addition, step counts do not provide goal-related content and thus progress bars were expected to influence participants' observer ratings of conscientiousness more than any other trait.

### **Control Variables**

In addition to the Big Five traits, achievement motivation and physical self-efficacy have been related to physical activity behaviour. Physical Self-Efficacy refers to a person's perceptions about their own capabilities for participating in physical activity (Bandura, 1997). In other words, it refers to the beliefs that individuals hold about how successful they will be when they participate in particular acts of physical activity. According to Bandura (1997), individuals high in self-efficacy should be more likely to be physically active because they believe that they have the capacity to do so. Achievement Motivation can be described as a need for success or a striving for excellence (Nicholls, 1984). Individuals high in achievement motivation tend to work diligently towards goals and also tend to persevere in the face of adversity. As such, these individuals should be more likely to adhere to physical activity interventions and programs due to their need for achievement. Indeed, Dishman and Ickes (1981) found that self-motivation (which was defined similarly to achievement motivation) was positively correlated with exercise frequency and attraction to exercise.

Both perceived physical self-efficacy and achievement motivation appear to have an influence on individuals' perceptions of their capabilities as well as their likelihood to engage in goal-setting behaviour. For this reason, both of these constructs are expected to play a role in people's physical activity behaviour and will therefore be controlled for throughout the analyses.

Given the similar measures used in both studies, they are presented below as organized by question of interest rather than by study.

## Methods

Participants in both studies consisted of students taking a first or second year psychology course at a large Canadian university and were collected using an online recruitment tool. In both studies, participants took part in a survey on personality, behaviours, physical activity and health.

### Study One

#### Participants

For Study One, 103 participants (64.10% female, 61.20% white,  $M_{\text{age}} = 20.21$ ,  $SD = 3.92$ , 50.00% average income, 53.40% first year students) were recruited. Most participants indicated that they had little to no physical health limitations ( $M = .82$ ,  $SD = 1.22$ ).

#### Procedure

Participants were shown a typical physical activity feedback screen and asked how important each component was to them, how visually appealing they found each component, and how much each component would influence their willingness to be active. Components of the feedback screen included step counts, progress bars, and leaderboards.

### Study Two

#### Participants

For Study Two, 109 (68.80% female, 58.70% white,  $M_{\text{age}} = 20.26$ ,  $SD = 4.60$ ) were recruited. Most participants indicated that they had little to no physical health limitations ( $M = .92$ ,  $SD = 1.38$ ).

## Procedure

Study Two consisted of a 2 (High vs. low count) x 2 (High vs. low progress) within-subjects design. Participants were shown four feedback screens in a randomized order and told to imagine that these displays represented another person's activity feedback. Participants then answered a number of questions about that target person's personality and were asked to respond based on the target's activity feedback. The four feedback displays are depicted in Figure 2.



Figure 2. Four Feedback Displays for Study Two depicting differing degrees of steps and progress.

## Measures

As a number of measures were utilized for both Study One and Study Two, the measures of interest for each study are described below.

### Both Studies

**Demographics** (Appendix A). Participants were asked a number of demographic questions. Participants were asked to indicate their age, gender, ethnicity, socioeconomic status, current year of education, and their degree of role limitations due to physical health.

**Mini-IPIP Scales** (MINI-IPIP; Donnellan, Oswald, Baird & Lucas, 2006; Appendix B). The Mini-IPIP scale is a short version of the 50-item International Personality Item Pool-Five Factor Model scale (Goldberg, 2006). There are a total of 20 questions, 4 for each of the Big Five categories (Extraversion, Neuroticism, Openness to Experience, Agreeableness, and Conscientiousness). Each question asked participants to indicate on a scale of 1 (*Strongly*

*Disagree*) to 5 (*Strongly Agree*) the extent to which each statement is accurate in describing themselves. Sample items include “I am the life of the party” (Extraversion), “I have a vivid imagination” (Openness to Experience), “sympathize with others” (Agreeableness), “get chores done right away” (Conscientiousness), and “have frequent mood swings” (Neuroticism). The means, standard deviations, and reliabilities for each of the Big Five traits are displayed in Table 1. The reliabilities for Conscientiousness in both studies were less than desirable. The reliability for Neuroticism in Study Two was less than desirable as well.

*Table 1. Means, Standard Deviations, & Reliabilities for Personality Measures.*

Measure	Study One			Study Two		
	M	S.D.	$\alpha$	M	S.D.	$\alpha$
E	3.11	.64	.75	3.18	.83	.75
A	3.54	.68	.76	3.69	.83	.79
C	3.77	.60	.52	3.44	.67	.58
N	2.60	.72	.83	2.91	.73	.54
O	3.37	.51	.55	3.36	.51	.67

***Role Limitations Due To Physical Health*** (RLPH; Ware & Sherbourne, 1992; Appendix C). The RLPH scale is a subscale of the MOS SF-36, a self-report measure consisting of a variety of questions related to health and well-being. There are four items asking participants to indicate any role limitations they have due to physical health problems. The scale ranges from 0 to 4, with a score of zero indicating no limitations and a higher score indicating more limitations. The RLPH scale was found to be reliable in both Study One (M = 1.80, SD = .30,  $\alpha$  = .75) and Study Two (M = 1.77, SD = .34,  $\alpha$  = .84).

***Achievement Seeking*** (AS; Goldberg et al., 2006; Appendix F). A ten-item subscale of the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982) available from the International Personality Item Pool was used to access achievement seeking. Participants were

asked to indicate how much they agreed with each statement on a five point Likert-scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Sample items include “I work hard,” or “I do more than what is expected of me.” The means, standard deviation, and reliabilities for the AS are displayed in Table 3.

***International Physical Activity Questionnaire*** (IPAQ; Craig et al., 2003; Appendix G).

The International Physical Activity Questionnaire is a three-item self-report measure that asked participants about their physical activity over the last seven days. Participants were asked about their time spent walking, their time spent in vigorous or moderately intense activity, and their time spent participating in sedentary behaviours. Participants are given a score for walking minutes per week, moderate activity minutes per week, and for vigorous activity minutes per week. A total score can then be calculated by summing the minutes per week for each type of activity. Calculations for scoring are shown in Table 2 below. The means, standard deviation, and reliabilities for the IPAQ are displayed in Table 3.

*Table 2. Scoring instructions for the IPAQ*

Type of Activity	Scoring Instructions
Walking	3.3 * walking activity minutes * walking days
Moderate	4.0 * moderate intensity activity minutes * moderate
Vigorous	8.0 * vigorous intensity activity minutes * vigorous days
Total	Walking + Moderate + Vigorous

***Perceived Physical Self-Efficacy Scale*** (PPSP; Ryckman, Robbins, Thornton, & Cantrell 1982; Appendix H). The Perceived Physical Self-Efficacy Scale consists of two smaller subscales, the 10-item Perceived Physical Ability (PPA) subscale, and the 12-item Physical Self Presentation Confidence (PSPC) subscale that asked participants a variety of questions related to

their thoughts and feelings about their own physical activity on a 6-point Likert-scale ranging from 1 (*Strongly Agree*) to 6 (*Strongly Disagree*). Sample items for the PPA include “I have excellent reflexes,” or “My physique is rather strong.” The reliability of the PPSC subscale was very low ( $\alpha = -.13$ ), and thus this scale was not used during analysis.

The means, standard deviation, and reliabilities for the PPA are displayed in Table 3.

*Table 3. Means, Standard Deviations, & Reliabilities for Additional Scales.*

Measure	Study One			Study Two		
	M	S.D.	$\alpha$	M	S.D.	$\alpha$
Achievement Seeking	3.54	.59	.79	3.59	.60	.81
IPAQ	209.45	270.79	.62	216.70	184.03	.69
PPA	3.81	.86	.85	2.93	.81	.82

### **Study One: Unique Measures**

**Feedback Questionnaire** (Appendix I). Participants were asked a number of questions pertaining to how they viewed the feedback they were presented. Participants were asked to indicate on a Likert-scale ranging from 1 (*Very Unappealing*) to 7 (*Very Appealing*) how visually appealing they found each of the components of the feedback screen displayed to them. An additional question asked participants to indicate how likely each component would be to influence their willingness to be active on a scale ranging from 1 (*Very Unlikely*) to 7 (*Very Likely*). Finally, participants were also asked to indicate how important they found each component for activity tracking on a 7-point Likert-scale ranging from 1 (*Very Unimportant*) to 7 (*Very Important*). Participants were then be asked to indicate which component of the feedback screen they found the most visually appealing (48.00% found progress bars the most appealing), the most likely to influence their willingness to be active (55.60% found progress bars most

likely to influence their willingness), and the most important in tracking activity (49.00% found that the progress bars were most important in tracking activity).

### **Study Two: Unique Measures**

*Feedback Questionnaire* (Appendix J). Participants were shown all four of the feedback conditions in a randomized order and then asked to imagine that the displayed feedback screen belongs to another individual and is depicting that individual's number of steps taken and the distance to the target's goal. They were then asked to respond to a version of the Ten Item Personality Inventory (TIPI; Gosling, Rentfrew, & Swann, 2003), modified to ask participants to make judgements about another target individual. There are two questions for each category of the Big Five (Extraversion, Emotional Stability, Openness to Experience, Agreeableness, and Conscientiousness). Each question asked participants to indicate on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) the extent to which each statement is accurate in describing the individual whose feedback they were presented. The items and the traits they are used to measure are displayed in Table 10 on page 37. Once participants had viewed and responded to each of the four feedback screens, they were asked to indicate on a 7-point Likert-scale how confident they were in their personality ratings. In addition, participants were asked to identify which items were the most and least difficult for them to answer. Finally, participants were then asked to indicate if they had utilized an activity tracker before in the past, and if so, to indicate whether they still currently use the device. Interestingly, while 24.80% of the participants indicated that they had used a tracker in the past, only 8.30% indicated that they were still currently use it.

The reliability ranges for the conditions in Study Two are displayed in Table 4.

*Table 4. Reliabilities for Conditions in Study Two.*

Personality Trait	M		S.D.		$\alpha$	
	Min	Max	Min	Max	Min	Max
E	3.38	4.89	1.04	1.28	.37	.58
A	4.07	4.31	.87	.93	-.21	.23
C	3.88	4.94	1.02	1.25	.31	.57
ES	3.78	4.70	.89	1.04	.15	.41
O	3.80	4.96	1.03	1.18	.37	.46

## **Plan of Analysis**

### **Study One**

In Study One my primary research goals were to identify the components of feedback people prefer the most, determine whether personality traits had an influence on these preferences, and to determine whether the relationship between preferences and personality held when controlling for additional differences such as achievement motivation and physical self-efficacy.

A series of t-tests were conducted in order to examine which components of feedback people preferred the most. Next, I examined the correlations between personality traits and preferences. Finally, a stepwise regression was conducted including demographic variables in step one, personality traits in step two, and then perceived self-efficacy and achievement motivation in step three.

### **Study Two**

In Study Two my primary research goal was to identify whether individuals would form perceptions about another person's personality based solely on that person's activity feedback. In addition, I also aimed to determine the effects of counts and progress on personality perception. In order to examine these questions, Study Two consisted of a 2 x 2 within-subjects design and a series of ANOVA's were conducted examining the main effects and potential interaction of counts and progress on perceived personality.

## Results

Table 5 outlines the correlations between physical activity and personality for both studies.

*Table 5. Correlations between the Big Five and Physical Activity*

	Study One				Study Two			
	Vigorous Activity	Moderate Activity	Walking Activity	General Activity	Vigorous Activity	Moderate Activity	Walking Activity	General Activity
E	.12 (.33)	-.04 (.73)	.04 (.72)	.05 (.68)	.09 (.36)	.03 (.79)	<.01 (.98)	.04 (.72)
A	-.16 (.13)	-.08 (.45)	-.13 (.22)	-.19 (.09)	<.01 (.99)	.04 (.70)	-.05 (.62)	.02 (.86)
C	-.14 (.19)	-.12 (.26)	-.10 (.32)	-.16 (.15)	.02 (.87)	.12 (.24)	.22* (.03)	.10 (.34)
N	.01 (.96)	.04 (.74)	.05 (.63)	.02 (.88)	.12 (.23)	.24* (.02)	.17 (.09)	.20 (.06)
O	-.03 (.81)	-.04 (.74)	-.12 (.30)	-.08 (.48)	-.04 (.78)	.02 (.89)	.19 (.06)	.03 (.77)

\* Significant at the .05 level (two-tailed)

### Study One

The means and standard deviations of the feedback questionnaire are displayed in Table 6.

*Table 6. Descriptives for Feedback Questionnaire.*

Question	Component	Mean	S.D.
Visual Appeal	Count	4.53	1.63
	Progress	4.72	1.53
	Leaderboard	4.10	1.93
Importance in Tracking Activity	Count	4.77	1.74
	Progress	5.16	1.58
	Leaderboard	3.55	1.81
Influence on Willingness to be active	Count	3.18	1.17
	Progress	3.45	1.13
	Leaderboard	2.97	1.36

Table 7 outlines the results of a series of t-tests aimed at determining which components of feedback people preferred the most. There was a significant difference in the scores for progress bars and for leaderboards in regards to visual appeal with participants finding progress bars more visually appealing. In addition, there was a significant difference in scores on the importance in

tracking activity for counts and progress bars. Participants found progress bars to be more important in tracking physical activity. There was also a significant difference in importance in tracking activity for counts and leaderboards with participants finding counts to be more important than leaderboards. Next, there was a significant difference in importance in tracking activity for progress bars and leaderboards. Participants found progress bars to be more important in tracking activity than leaderboards. In regards to scores for influence on willingness to be active, there was a significant difference between counts and progress bars indicating that participants found progress bars more likely to influence their willingness to be active. Finally, there was a significant difference in willingness to be active between scores for progress bars and leaderboards with participants finding the progress bars more likely to influence their willingness to be active than leaderboards.

*Table 7. Feedback Preferences (Study One)*

	Comparison	df	<i>t</i>	<i>p</i>
Visual Appeal	Count vs. Progress	101	1.11	.27
	Count vs. Leaderboard	101	1.96	.05
	Progress vs. Leaderboard	101	2.80	.01*
Importance in Tracking Activity	Count vs. Progress	98	-2.24	.03*
	Count vs. Leaderboard	98	5.62	.03*
	Progress vs. Leaderboard	98	7.27	<.01*
Likelihood to Influence one's Willingness to be Active	Count vs. Progress	92	-2.20	.03*
	Count vs. Leaderboard	91	1.07	.29
	Progress vs. Leaderboard	91	2.78	.01*

\* *Significant at the .05 level (two-tailed)*

The association between Extraversion and leaderboard willingness was the only significant trait-component association and a single regression analysis was conducted in order to follow up on the main effect. Extraversion significantly predicted leaderboard willingness,  $b = .08$ ,  $t(72) = 2.37$ ,  $p = .02$ , after controlling for achievement motivation and perceived physical ability. The regression results are displayed in Table 8.

*Table 8. Study One Regression Results*

	B	S.E	Beta	<i>t</i>	Sig.
Extraversion	.08	.04	.29	2.37	.02*
Achievement Motivation	-.01	.03	-.05	-.38	.70
Perceived Physical Ability	.12	.21	.08	.56	.58

\* *Significant at the .05 level (two-tailed)*

### **Study One Summary**

Study one provided evidence that participants preferred the progress bar over the other forms of feedback and that personality did not appear to play a role in these preferences. In addition, personality was unrelated to who was currently using an activity tracker or who had used one in the past. Past research on personality perception has shown that static cues can provide individuals with enough information to make personality judgements, and thus it may be the case that these feedback displays can provide people with clues about a person's personality, despite the fact that study one found personality unrelated to feedback preferences or past/current tracker use. Study two aimed to answer this question by identifying whether participants would make personality judgements about another individual based solely on that individual's activity feedback.

### **Study Two**

Table 9 outlines the trait and item level results of a series of repeated measures ANOVA's measuring the effects of counts and progress on personality perception. The item level analysis was conducted due to poor reliabilities for each trait assessed by the TIPI. There were main effects for both counts and progress bars for each factor of the Big Five, except for Agreeableness. Feedback that showed greater degrees of activity resulted in participants perceiving the target's personality more positively on each of the Big Five, apart from

Agreeableness. The higher the counts or progress was, the more likely participants would consider that person to have higher scores on the traits of Extraversion, Conscientiousness, Emotional Stability, and Openness to Experience.

In addition, there was a significant interaction between counts and progress in regards to openness to experience,  $F(1, 106) = 6.21, p = .01$ . That is, counts had a stronger influence on participants' perceptions of the target's Openness when progress was high. In other words, while having a high step count lead participants to perceive the target more positively, this effect was stronger when progress was also high.

*Table 9. Effects of Counts & Progress on Personality Perception at the Trait & Item level*

Trait	Item	df	Counts		Progress		Counts x Progress	
			F	p	F	p	F	p
E	Total	(1, 106)	19.59	.00*	62.33	.00*	.79	.38
	Extraverted, Enthusiastic	(1, 107)	16.80	.00*	70.24	.00*	.37	.55
	Reserved, Quiet	(1,107)	10.45	.00*	34.18	.00*	1.13	.29
A	Total	(1, 104)	.26	.62	3.46	.07	.03	.85
	Critical, Quarrelsome	(1, 105)	.03	.87	.48	.49	.04	.84
	Sympathetic, Warm	(1, 107)	.17	.68	3.14	.08	.03	.86
C	Total	(1, 106)	14.70	.00*	32.46	.00*	.82	.37
	Dependable, Self-Disciplined	(1, 106)	11.63	.00*	32.54	.00*	1.93	.17
	Disorganized, Careless	(1,108)	10.81	.00*	18.63	.00*	.01	.92
ES	Total	(1, 101)	4.93	.03*	39.79	.00*	3.02	.09
	Anxious, Easily Upset	(1, 103)	5.97	.02*	32.01	.00*	.33	.56
	Calm, Emotionally Stable	(1, 106)	.70	.40	29.40	.00*	3.26	.07
O	Total	(1, 106)	13.46	.00*	44.54	.00*	6.21	.01*
	Open to New Experiences, Complex	(1, 107)	12.16	.00*	51.88	.00*	5.60	.02*
	Conventional, Uncreative	(1, 107)	7.92	.01*	16.24	.00*	.81	.37

\* Significant at the .05 level (two-tailed)

Once participants had completed each of the four conditions in Study Two, they were asked to indicate how confident they were in their ratings of the target's personality. The results show that 61.40% of participants were at least somewhat confident in their personality judgements, while very few were not confident in their ratings whatsoever (9.20%). In addition to indicating their degree of confidence, participants were also asked to indicate which items were difficult to answer. Table 10 depicts each of the ten items used to measure participants' perceptions of the target's personality, the number of participants who indicated that item as difficult to answer, and the personality trait that item was used to assess. It is interesting to note that some participants indicated having difficulty answering with respect to one item for a Big Five trait, but not the other indicator of the same trait. For example, Openness had one item that 19 participants had difficulty answering and another item that no one reported any difficulty with. There is a similar ratio for both Extraversion (20-7) and Emotional Stability (13-2) as well.

*Table 10. Frequency of Items Rated as Difficult*

Item	Number of Mentions	Personality Trait
1) Extraverted, Enthusiastic	20	Extraversion
2) Conventional, Uncreative	19	Openness
3) Calm, Emotionally Stable	13	Emotional Stability
4) Sympathetic, Warm	8	Agreeableness
5) Dependable, Self-Disciplined	7	Conscientiousness
6) Reserved, Quiet	7	Extraversion
7) Critical, Quarrelsome	6	Agreeableness
8) Disorganized, Careless	5	Conscientiousness
9) Anxious, Easily Upset	2	Emotional Stability
10) Open to new experiences, Complex	0	Openness

## Discussion

The current studies investigated the relationship between personality, feedback preferences, and physical activity. More specifically, Study One investigated how personality may influence the preferences that people have about their activity feedback, while Study Two investigated the effects of steps and progress bars on observer reports of personality. While physical activity is an important part of maintaining a healthy lifestyle, a large number of college-aged individuals suffer from reductions in physical activity and increases in sedentary behaviour (Bray & Born, 2004). College-aged individuals have grown up surrounded by technology (Anderson & Raine, 2012) and are commonly required to use it during the completion of their degree (Huffman & Huffman, 2011). This increase in the use of technology has contributed to increases in sedentary behaviour among college students (DeForche, 2015), and provides a unique opportunity to utilize technology as a tool to promote physical activity.

The primary goals of Study One were to identify which components of feedback people preferred and found the most important, and to determine whether personality traits influenced these preferences. First, it was expected that extraverted individuals would find the leaderboards to be the most important aspect of the feedback display. Second, it was expected that conscientious individuals would find the progress bars to be more important than step counts. Finally, it was hypothesized that individuals who score higher on neuroticism would prefer the leaderboards the least, in addition to finding them to be the least important in tracking activity.

Study One found that in general participants indicated that the progress bar component of the feedback screen was the most visually appealing, the most important in tracking activity, and the most likely to influence their willingness to be active. Additionally, participants indicated that step counts were more important in tracking activity than leaderboards. These findings show

that in general, participants preferred feedback that was goal related over other forms of feedback. That is, feedback that was goal related seemed to be more valuable to participants than feedback about general activity, or feedback about how they compared to others. Future research should investigate whether providing individuals with personal activity related goals is more or less effective in promoting activity than comparing them to other individuals through competition. As evidenced by the fact that participants preferred the progress bars over other forms of feedback, it appears that people are more concerned with competing with themselves (by setting activity related goals) than competing with other people. One caveat is that the leaderboard display shown in Study One was not personal to the participants. Future research should aim to determine whether participants would still be more focused on competing with themselves if they were close to the other individuals displayed in the leaderboard. It may be the case that personal activity related goals are more motivating than competing with random individuals, but less motivating than competing with close friends or acquaintances.

In Study One, there was only one significant trait-component association, with highly extraverted individuals finding the leaderboard to be the most likely to influence their willingness to be active. The lack of correlations between other personality traits and feedback preferences suggests that when researchers are designing activity programs or regimens, tailoring feedback to individuals' personality may not be the most effective strategy. Progress bars were preferred over both steps and leaderboards across all categories (importance, appeal, and how likely it will influence one's willingness to be active), and so rather than tailoring feedback to personality, it may be more effective to design feedback that allows users to set detailed activity related goals that they can work and strive towards. Past research by Ullrich-French, Cox and Bumpus (2013) suggested that future research should focus on helping

individual's link personally meaningful activities to their lifestyle in order to increase engagement and motivations. Perhaps feedback could provide suggestions to users on how to be active that are specific in nature, providing users with unique activity related goals. For example, if a user indicates that they enjoy basketball, they could be shown a display that sets goals for them such as "Do ten lay-ups today," or "Make ten free-throws today." The aim would be to provide users with unique goals with the hope that they will be more engaged and motivated to complete these goals. These goals do not necessarily need to be big in nature, and can be used as a way to simply get the user out and active in the first place. Displays could even be designed to provide the individual with information on nearby facilities, leagues, classes, etc., so that they will have opportunities to engage in and complete their goals. In addition, sports teams may be a particularly effective activity to set goals for, as Tauer and Harackiewicz (2009) found that team sports can provide more opportunities for skill development and are linked to more autonomous motives for being active. By having participants set goals that are related to team activities, they are provided with opportunities to compete with not only themselves, but for their team as well, providing them with both intrinsic and external motivation to be active.

The results of Study One were unexpected, but provided interesting information in regards to activity feedback preferences. Extraversion was found to be correlated with finding leaderboards the most likely to influence activity. It is interesting to note that while extraverted individuals did not appear to find the leaderboards more important in tracking activity, it was still the component most likely to influence their willingness to be active. Self-Determination Theory (Ryan & Deci, 2007) states that more self-determined forms of motivation will lead to more adaptive responses, but this may not necessarily be the case. An important question for researchers to ask is "what makes something intrinsically motivating?" Or more specifically, is

something intrinsically motivating because it is important to the individual, or because it is likely to lead to behaviour change? Study One appears to provide support for the latter, with extraverted individuals indicating that while progress bars were the most important in tracking activity, the leaderboards were the most likely to actually modify their behaviour. Future research should investigate this relationship further, and aim to identify other components of feedback that are likely to lead to behaviour change.

The primary goal of Study Two was to identify whether individuals would form perceptions about another person's personality based solely on viewing feedback about that person's physical activity. First, it was expected that participants would indicate that the high step count display was from an extraverted individual. Second, it was expected that participants would indicate that the high progress display was from a conscientious individual.

Study Two found that level of steps and progress both influenced participants' personality judgements for every personality trait except for Agreeableness. That is, participants perceived the target's personality more positively for the traits of Extraversion, Conscientiousness, Emotional Stability, and Openness when the level of steps and progress were higher. The lack of a finding for Agreeableness could be because participants perceived targets with indicated higher levels of steps and progress as more competitive, thus cancelling out the positive perception seen for the other traits. These findings suggest that the feedback screens that indicated higher degrees of activity lead participants to perceive the target individuals personality more positively than the feedback screens that indicated lesser degrees of activity.

The feedback displays in Study Two were deliberately designed so that the only information participants could use to make their judgements were the number of steps and degree of progress. Even with such little information, participants still formed perceptions about the

target's personality in ways that were consistent with each other. Each trait had at least one item that participants found difficult to answer, so it may not be the case that judging certain traits is more difficult than judging others. The items that participants had more trouble with were ones that involved less tangible information about the target, typically involving how they think or feel as opposed to act. For example, a number of participants indicated that the item "Conventional, Uncreative," was difficult for them to answer, while the item "Open to new experiences, Complex," was not, even though both of these items are used to measure the same trait, Openness to Experience. It is difficult for observers to know whether someone is uncreative, because we do not have access to a target's thoughts and emotions to the same degree that the target does. On the other hand, it can be quite easy to tell when someone is open to new experiences, because being open to and engaging in new experiences involves behavioural activation. For example, Vazire and Gosling (2004) found that brief, in-person interactions provided more information regarding Extraversion than personal websites because Extraversion is a trait closely linked to behaviour. That is, behavioural clues provide more information regarding Extraversion than identity claims. Similar to Extraversion, physical activity involves the activation of behaviour, and so items that are related to behaviour should be easier for participants to make perceptions about.

Study Two provides clear evidence that individuals can and do utilize other people's activity feedback to form impressions about those people's personalities. An important goal for future research has thus become to identify how these perceptions actually influence behaviour. Past research by Ullrich-French and Cox (2009) found that increases in relatedness were associated with feelings of external pressure to be active. That is, the closer two people become, the more pressure they feel from each other to be active. Perhaps as two people get to know each

other better, they become more wary of how they are perceived by each other and thus feel pressured to be active in order to promote more positive perceptions. This could be one possible mechanism by which conscientious people are more active. Fayard, Roberts, Robins, & Watson (2012) found that Conscientious individuals are prone to experiencing more guilt, and that these individuals' feelings of guilt work with Conscientiousness to produce achievement behaviours. Future research should investigate whether Conscientious individuals are more active because they feel a higher degree of guilt when they do not meet other's expectations. This feeling of guilt or shame may then contribute to the individual engaging in more activity behaviour with the hope that they will alleviate any guilt or shame they are feeling.

Study One showed that participants preferred goal-oriented activity feedback, and Study Two provided clear evidence that activity tracking information is a cue that people will utilize when perceiving other people's personality. These two findings, taken together, raise an important question for future research: Could other people's perceptions be used as a motivational tool? Past research on personality and reputation has identified a number of individual differences that influence how important an individual finds their reputation. For example, individuals who are focused on minimizing losses tend to be more worried about their reputation and will work harder to achieve a positive reputation in groups they deem important (Cavazza, Guidetti, & Pagliaro, 2015). Future research and/or activity promotion programs could design feedback displays that help users identify and hit their goals with the hope that by completing these goals, they will be able to influence how they are perceived by others. In the past, there have been many attempts to promote activity by either focusing on the health benefits of engaging in activity, or the negative effects of not engaging in activity, and neither has been particularly effective (Latimer, Brawley, & Bassett, 2010). Future research should aim to

determine whether informing users that they can utilize activity behaviour to improve how others perceive them could be a more effective way of promoting physical activity.

An interesting next step would be to utilize feedback displays with targets' real activity so that researchers can determine the accuracy of participants' judgements made from such little information. If the judgements are indeed accurate, it could have important implications in regards to developing physical activity programs and interventions in the future. For example, if people are aware that they will be viewed more positively by others if they are seen as more active, then they may be more likely to engage in activity in the hopes of being viewed more positively. Additionally, if activity behaviour can influence how people perceive each other, it may be possible that team membership can also influence people's perceptions of other individuals' personality. In other words, can simply being a member of a sports organization result in individuals being perceived differently? In addition, future research should aim to identify whether these perceptions will also be positive, similar to how higher levels of general activity lead to more positive perceptions of personality. On the other hand, it may be that belonging to a particular sports organization or group may lead to negative perceptions about that individual. For example, it may be the case that an individual who plays football will be perceived as less intelligent than an individual who plays baseball.

It also raises interesting questions regarding personal versus public activity programs and regimens. If individuals are aware that other people will make judgements about them based on their activity, then they can potentially utilize this information to increase the likelihood that others will perceive them a certain way. Additionally, keeping parts of one's activity private may also prevent others from making judgements related to that activity. If a person can pick and choose what to make public then they are likely to only make things public which improve their

image. It would be interesting for future research to determine whether removing individuals' control over whether their activity is made public could increase their motivation. For example, if a person's activity tracking device posts the number of steps they take every day to social media (no matter how many or how few) than perhaps they would be more motivated to hit their daily step goals. If that person can choose what to display, they may only make public the days in which they have hit their goals.

Both studies aimed to replicate past findings on personality and physical activity, but found mixed evidence in support of previous claims regarding personality and physical activity. When analyzed at the item-level, it was clear that some items were easier for participants to answer than others. Perhaps the relationship between personality and physical activity is more nuanced, and should be analyzed at the item level, or analysed using strictly behaviour related items.

### **Limitations**

The current study had several limitations. First, the reliabilities for Conscientiousness in Study One were relatively low. In addition, the reliability for the Perceived Physical Self-Presentation Confidence scale was so low it led to an inability to utilize this measure in the analysis. Due to poor reliabilities for the perceived personality measure in Study Two, participants' perceptions of the target's personality were analyzed at both the trait and item level. Additionally, all of the participants were recruited from the same university and thus generalizing the results may be difficult.

## Conclusion

The current research sought to investigate the relationship between personality, feedback preferences, and physical activity behaviour. While personality did not appear to influence the preferences participants had for feedback, the results of Study One provided evidence that in general people preferred goal-related feedback over other formats. Participants were more concerned with competing with themselves than others, and thus it is expected that setting activity related goals may be the most effective strategy for physical activity promotion.

Study Two showed that individuals can and will utilize other people's activity feedback to form perceptions about those people's personalities. More specifically, participants perceived the targets whose displays indicated higher levels of activity more positively for every Big Five trait except for Agreeableness. It is important to note that participants had a more difficult time answering items that were unrelated, or less related, to behaviour. Personality perception appears to be quite nuanced and future research should analyze it from an item or facet level in order to gain a better understanding of how people come about making these perceptions.

The results of both studies raise an interesting question for both personality and physical activity research: Can other people's perceptions of our personalities be utilized as a motivational tool? Study Two provided clear evidence that people will form personality perceptions based on activity feedback and future research should be conducted in order to gain a more robust understanding of how other people's perceptions could be used to promote physical activity.

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APPENDIX A

Demographics

- 1) Gender:                      Female [  ]      Male [  ]
  
- 2) Age: \_\_\_\_\_
  
- 3) Ethnicity:  
  
                    Caucasian/White [  ]  
  
                    African/African American/African-Canadian [  ]  
  
                    Hispanic/Latin American [  ]  
  
                    Middle Eastern [  ]  
  
                    Asian/Asian-American/Asian-Canadian [  ]  
  
                    Other: \_\_\_\_\_ [  ]
  
- 4) Please check the box that corresponds to the income of the household of your upbringing:  
  
                    Lower Income [  ]  
  
                    Lower Middle Income [  ]  
  
                    Middle Income [  ]  
  
                    Upper Middle Income [  ]  
  
                    Upper Income [  ]
  
- 5) What year of post-secondary education are you currently enrolled in?  
  
                    First Year [  ]  
  
                    Second Year [  ]  
  
                    Third Year [  ]  
  
                    Fourth Year [  ]  
  
                    Other [  ]

APPENDIX B

Mini-IPIP Scales

Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

[1] = Strongly Disagree

[2] = Disagree

[3] = Neutral

[4] = Agree

[5] = Strongly Agree

Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

- 1) Am the life of the party.
- 2) Sympathize with others' feelings.
- 3) Get chores done right away.
- 4) Have frequent mood swings.
- 5) Have a vivid imagination.
- 6) Don't talk a lot. (R)
- 7) Am not interested in other people's problems. (R)
- 8) Often forget to put things back in their proper place. (R)
- 9) Am relaxed most of the time. (R)
- 10) Am not interested in abstract ideas. (R)
- 11) Talk to a lot of different people at parties.
- 12) Feel others' emotions.

- 13) Like order.
- 14) Get upset easily.
- 15) Have difficulty understanding abstract ideas. (R)
- 16) Keep in the background. (R)
- 17) Am not really interested in others. (R)
- 18) Make a mess of things. (R)
- 19) Seldom feel blue. (R )
- 20) Do not have a good imagination. (R)

**Scoring Instructions:** 1) Items denoted with an “R” are to be reverse coded.

2) Sum the scores by factor as follows:

Extraversion: 1, 6, 11, 16.

Neuroticism: 4, 9, 14, 19.

Conscientiousness: 3, 8, 13, 18.

Agreeableness: 2, 7, 12, 17.

Openness to Experience: 5, 10, 15, 20.

APPENDIX C

Role Limitations due to Physical Health (RLPH)

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

1) Cut down the amount of time you spent on work or other activities.

Yes

No

2) Accomplished less than you would like.

Yes

No

3) Were limited in the kind of work or other activities.

Yes

No

4) Had difficulty performing the work or other activities (for example, it took extra effort).

Yes

No

**Scoring instructions:** Yes = 1, No = 0. Sum the four questions. A higher score indicates more limitations.

APPENDIX D

Achievement Seeking

Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

[1] = Strongly Disagree

[2] = Disagree

[3] = Neutral

[4] = Agree

[5] = Strongly Agree

Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

- 1) Work hard.
- 2) Do more than what's expected of me.
- 3) Do just enough work to get by. (R)
- 4) Continue until everything is perfect.
- 5) Am not highly motivated to succeed. (R)
- 6) Do too little work. (R)
- 7) Excel in what I do.
- 8) Work too much.
- 9) Have a slow pace to my life. (R)
- 10) Plunge into tasks with all my heart.

**Scoring Instructions:** 1) Items denoted with an “R” are to be reverse coded.

2) Sum items together and divide by 10 to obtain score.

## APPENDIX E

## International Physical Activity Questionnaire

You will be asked a number of questions about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous activities** which take **hard physical effort** that you did **in the last 7 days**. Vigorous activities that make you break much harder than normal and may include heavy lifting, digging, aerobics, or fast bicycling. Think about those physical activities that you did for at least 10 minutes at a time.

- 1) During the **last 7 days**, on how many days did you do **vigorous** physical activities?

\_\_\_\_\_ Days per week

Don't Know/Not Sure

- 2) How much time did you usually spend doing **vigorous** physical activities on one of those days?

\_\_\_\_\_ Hours Per Day

\_\_\_\_\_ Minutes Per Day

Don't Know/Not Sure

Now think about activities which take **moderate physical effort** that you did in the last 7 days. Moderate physical activities make you breathe somewhat harder than normal and may include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did **for at least 10 minutes at a time**.

- 3) During the **last 7 days**, on how many days did you do **moderate** physical activities?

\_\_\_\_\_ Days per week

Don't Know/Not Sure

- 4) How much time did you usually spend doing **moderate** physical activities on one of those days?

\_\_\_\_\_ Hours Per Day

\_\_\_\_\_ Minutes Per Day

Don't Know/Not Sure

Now think about the time you spent walking in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

- 5) During the **last 7 days**, on how many days did you walk for at least 10 minutes at a time?

\_\_\_\_\_ Days per week

Don't Know/Not Sure

- 6) How much time did you usually spend **walking** on one of those days?

\_\_\_\_\_ Hours Per Day

\_\_\_\_\_ Minutes Per Day

Don't Know/Not Sure

Now think about the time you spent **sitting** on week days during the **last 7 days**. Include time spent at work, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television.

- 7) During the **last 7 days**, how much time did you usually spend **sitting** on a **week day**?

\_\_\_\_\_ Hours Per Day

\_\_\_\_\_ Minutes Per Day

Don't Know/Not Sure

## APPENDIX F

## Perceived Physical Self-Efficacy Scale

Please answer the following questions about yourself by indicating the extent of your agreement on a scale ranging from 1 (Strongly Agree) to 6 (Strongly Disagree). Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

- 1) I have excellent reflexes. (1)
- 2) I am not agile and graceful. (1) (R)
- 3) I am rarely embarrassed by my voice. (2) (R)
- 4) My physique is rather strong. (1)
- 5) Sometimes I don't hold up well under stress. (2)
- 6) I can't run fast. (1)
- 7) I have physical defects that sometimes bother me. (2)
- 8) I don't feel in control when I take tests involving physical dexterity. (1) (R)
- 9) I am never intimidated by the thought of a sexual encounter. (2)
- 10) People think negative things about me because of my posture. (2) (R)
- 11) I am not hesitant about disagreeing with people bigger than me. (2)
- 12) I have poor muscle tone. (1)
- 13) I take little pride in my ability in sports. (1) (R)
- 14) Athletic people usually do not receive more attention than me. (2)
- 15) I am sometimes envious of those better looking than myself. (2)
- 16) Sometimes my laugh embarrasses me. (2) (R)
- 17) I am not concerned with the impression my physique makes on others. (2)

18) Sometimes I feel uncomfortable shaking hands because my hands are clammy. (2) (R)

19) My speed has helped me out of some tight spots. (1) (R)

20) I find that I am not accident prone. (2) (R)

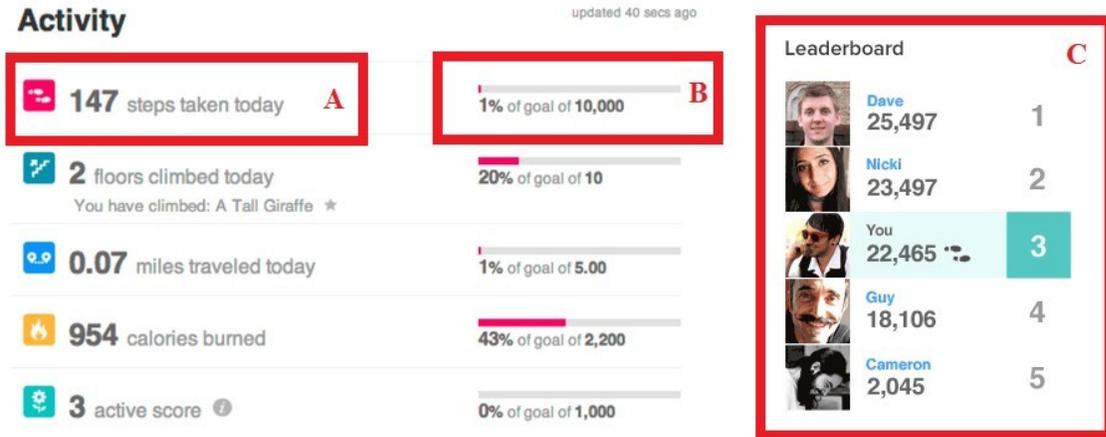
21) I have a strong grip. (1) (R)

22) Because of my agility, I have been able to do things which many others could not do. (1)

**Note.** (R) = item score is reversed; numbers in parentheses following statements indicate Factor 1 (Perceived Physical Ability) or Factor 2 (Physical Self-Presentation Confidence) items.

APPENDIX G

Feedback Questions for Study One



How visually appealing do you find...

1) The Count Total (A)	1	2	3	4	5	6	7
2) The Progress Bar (B)	1	2	3	4	5	6	7
3) The Leaderboard (C)	1	2	3	4	5	6	7

Which of these components do you find the most visually appealing?

- a) The Count Total (A)
- b) The Progress Bar (B)
- c) The Leaderboard (C)

How important do you find \_\_\_\_\_ for tracking physical activity?

4) The Count Total (A)	1	2	3	4	5	6	7
5) The Progress Bar (B)	1	2	3	4	5	6	7
6) The Leaderboard (C)	1	2	3	4	5	6	7

Which of these components do you find the most important for tracking physical activity?

- a) The Count Total (A)
- b) The Progress Bar (B)
- c) The Leaderboard (C)

How much would \_\_\_\_\_ influence your willingness to be active?

- |                         |   |   |   |   |   |   |   |
|-------------------------|---|---|---|---|---|---|---|
| 7) The Count Total (A)  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8) The Progress Bar (B) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9) The Leaderboard (C)  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Which of these components do you think would be most likely to influence your willingness to be active?

- a) The Count Total (A)
- b) The Progress Bar (B)
- c) The Leaderboard (C)

## APPENDIX H

### Modified Ten-Item Personality Inventory used in Study Two

Each panel of Figure 2 will be displayed here.

The figure above displays another individual's performance feedback on a typical activity monitoring device. Based on the information provided in the figure, please rate the following on a five point Likert-scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Based on their feedback, this person:

1. \_\_\_\_ Extraverted, enthusiastic.
2. \_\_\_\_ Critical, quarrelsome.
3. \_\_\_\_ Dependable, self-disciplined.
4. \_\_\_\_ Anxious, easily upset.
5. \_\_\_\_ Open to new experiences, complex.
6. \_\_\_\_ Reserved, quiet.
7. \_\_\_\_ Sympathetic, warm.
8. \_\_\_\_ Disorganized, careless.
9. \_\_\_\_ Calm, emotionally stable.
10. \_\_\_\_ Conventional, uncreative.

TIPI scale scoring ("R" denotes reverse-scored items):

Extraversion: 1, 6R; Agreeableness: 2R, 7; Conscientiousness: 3, 8R; Emotional Stability: 4R, 9;  
Openness to Experiences: 5, 10R.