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Promoting Physical Activity in Individuals with Disabilities

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PROMOTING PHYSICAL ACTIVITY IN INDIVIDUALS WITH DISABILITIES

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Introduction

As defined by the Americans with Disabilities Act (ADA) of 1990, a disability is "a physical or mental impairment that substantially limits one or more major life activities". In 2014, it was found that approximately 12.6% of all individuals in the United States have a disability (Erickson, Lee, & von Schrader, 2016). When comparing adults with disabilities to adults without disabilities, those with a disability are three times more likely to suffer from certain diseases such as heart disease, stroke, diabetes, and some forms of cancer (Centers for Disease Control and Prevention (CDC), 2016). One way to combat this increase in disease risk is by participating in regular physical activity; however, it has been reported that up to 50% of adults with disabilities are engaging in no leisure time physical activity (CDC, 2006). The greatest differences in physical activity accumulation also exist between individuals with moderate to severe disabilities and individuals without disabilities; thus, there is a need for interventions and a positive change in regards to physical activity in those with disabilities (Rimmer, 2008). One reason this low level of physical activity participation is of increasing concern is that individuals with disabilities have higher rates of other health problems due to living sedentary lifestyles (Khahn, Hammond, & Turner, 2006). Therefore, it is progressively important for the promotion of participation in physical activity for individuals with disabilities in order to reduce symptoms of comorbid conditions, expand abilities associated with activities of daily living, and increase quality of life (U.S. Department of Health and Human Services (USDHHS), 2005).

Physical Activity Guidelines

The *2008 Physical Activity Guidelines for Americans* provide the basics for how to

improve health through physical activity and how to reduce the risk of some health problems for Americans aged 6 and older. These guidelines were developed by the United States Department of Health and Human Services and describe how regular physical activity results in long-term health benefits when done each week over a period of time. In order to accurately provide standards for individuals, the guidelines are split into three major age groups: children and adolescents, adults, and older adults. There are two types of physical activity that are highlighted in the guidelines, and these are aerobic activity and muscle-strengthening activity.

Aerobic activity is any type of exercise that utilizes the movement of large muscle groups in a repetitive motion for a continued period of time. This form of physical activity increases heart rate, and with regularity, it makes the cardiovascular system stronger. In terms of aerobic activity, adults (aged 18 to 64 years old) should accumulate 150 minutes of moderate-intensity, or 75 minutes of vigorous-intensity, or a combination of moderate- and vigorous-intensity physical activity each week (USDHHS, 2008a). It is recommended that physical activity be completed in bouts lasting at least 10 minutes, and in order to reduce the risk of injury, it is best for the activity to be spread out over the course of the week (USDHHS, 2008c). Some benefits of aerobic activity include lower risk of early death, heart disease, stroke, hypertension, type 2 diabetes, and depression (USDHHS, 2008a). In order to achieve greater health benefits through physical activity, individuals can increase moderate-intensity aerobic activity to 300 minutes a week or vigorous-intensity activity to 150 minutes a week. This means that for those who accumulate greater than the recommended amount, there is an even lower risk of being diagnosed with certain diseases such as heart disease and type 2 diabetes (USDHHS, 2008b).

In terms of muscle-strengthening activity, individuals should be performing strength-training activities 2-3 days per week, and it should involve all major muscle groups (legs, hips,

back, chest, abdomen, shoulders, and arms) (USDHHS, 2008a). Some common examples of muscle-strengthening activities are resistance training, push-ups, pull-ups, and sit-ups (USDHHS, 2008c). Also, it is suggested to perform 1-2 sets of eight to twelve repetitions for each exercise. The benefits that are accompanied with this type of activity are not found by doing aerobic activity. Some of these benefits include increased bone strength and increased muscular fitness (USDHHS, 2008b).

Individuals with disabilities aged 18 and older should meet—or attempt to meet—the guidelines established for adults. If unable to meet these guidelines, adults with disabilities should attempt to engage in regular physical activity as much as possible and should avoid being sedentary (USDHHS, 2008e). One aspect of the guidelines that is specific for this population is the need to consult with health-care professionals regarding the amount and modes of physical activity that are suitable for their lifestyle and their ability level (USDHHS, 2008d). In meeting with a health-care provider, it should be explained how the individual's disability plays a role in affecting his/her capability of participating in physical activity (CDC, 2016). The possible barriers to physical activity should be discussed, and potential programs, resources, and physical activity options should be recommended to the individual. Some examples of resources and programs are joining a local gym, going to a fitness center for individuals enrolled at a college university such as the Tennessee Recreational Center for Students (TRECS) at the University of Tennessee, Knoxville (UTK), or joining teams such as the Challenger League in Knoxville, TN. Some examples of aerobic physical activity for individuals with disabilities include walking, hand-crank bicycling, horseback riding, swimming laps, wheelchair basketball, or seated volleyball (CDC, 2016). For those individuals who are not able to adopt the guidelines for typical adults, they should work alongside a health-care professional to create a safe physical

activity program that is achievable with their ability level and that will not cause the individuals harm (USDHHS, 2008e). One major key of the guidelines that is particularly applicable for adults with disabilities is: "Some physical activity is better than none—and any amount has health benefits" (USDHHS, 2008c). For individuals with disabilities, associated benefits of meeting the guidelines include those found for adults without disabilities as well (USDHHS, 2008b).

Step Count Recommendations

While the *2008 Physical Activity Guidelines for Americans* provides an established set of recommendations based on the amount of time spent exercising per week, another guideline that has grown in popularity is the accumulation of 10,000 steps a day. This value originated in Japanese walking clubs during the 1960s and continues to remain prevalent in Japanese culture today (Tudor-Locke & Bassett, 2004, p. 3). Numerous studies and organizations such as Shape Up America!, the National Health Service, The Walking Site, and America's Walking support the number of 10,000 steps per day as having numerous health benefits (similar to those associated with the previously mentioned 2008 guidelines by the USDHHS). This number was established based on the amount of activity that is needed for weight management and represents an easy to remember and concrete goal for measuring physical activity (Shape Up America!, 2016).

FUTURE Program

The University of Tennessee founded the FUTURE Postsecondary Education Program through the College of Education, Health, and Human Sciences. This program spans the course of two years and is for individuals who are diagnosed with either an intellectual disability or autism spectrum disorder and are between the ages of 18 to 29 years old (FUTURE, n.d.). The

FUTURE program lets students continue to acquire a higher education after high school and expands the number of opportunities for both future employment and for overall independence skills. As part of their curriculum, students must take courses on-campus that teach appropriate social skills and skills for living an independent life, and they must also take a number of physical education classes. Upon graduation, students are awarded a Postsecondary Educational Certificate for their completed training in areas that include academics, social skills, vocational objectives, and independent living skills (FUTURE, n.d.).

Study Purpose

Due to individuals with disabilities having high rates of physical inactivity and certain diseases due to sedentary lifestyles, there is a need for programming to educate and increase their physical activity levels. The FUTURE program at the University of Tennessee provides an opportunity to engage sedentary, low activity individuals with disabilities through educational programming to help increase their activity levels. Therefore, the purpose of this study was to determine if the promotion and encouragement of physical activity will positively influence the amount of daily physical activity amassed by individuals with disabilities. It is hypothesized that there will be positive differences between post-intervention (follow-up) data and baseline data, with the students engaging in a higher quantity of daily and weekly physical activity after intervention.

Participants

Six students enrolled in the FUTURE program at UTK agreed to participate in the study. These individuals were recruited to participate in this study via face-to-face meetings held at the university. In addition, these participants were part of a larger study focused on physical activity goal setting where they were asked to increase their physical activity to achieve a set step goal

each week. All of these participants were between the ages of 18-29 years old, were mobile without the use of a walking aide or wheelchair device, and presented with at least one diagnosed disability. In addition, participants were excluded if they were already active and took more than 8,000 steps per day. Any individuals who did not meet all of these criteria were excluded from the project. Prior to participation, participants and parents/guardians signed an informed consent form. Prior to starting, the study was approved by the University of Tennessee Institutional Review Board.

Equipment

Fitbits are one of many wearable electronic devices that allow one to self-monitor physical activity by receiving information on estimates of steps, energy expenditure, and distance traveled per day ("Make fitness a lifestyle with Flex," 2016). The manufacturers of Fitbit claim that all devices are between 95 to 97 percent accurate for step count; through analyzing published studies, it was determined that the validity and reliability for step count and the reliability for energy expenditure are all high compared to other forms of activity trackers (Evenson, Goto, & Furberg, 2015). The FitBit Flex, which is one type of wireless activity tracker, was selected for use in this study. This water-resistant FitBit is worn around the wrist and can be worn during sleep each night; however, it should be removed during water activities (e.g., showering or swimming) ("Make fitness a lifestyle with Flex," 2016). The Flex can be set-up to automatically sync all data to an individual's account where charts and graphs can be used to compare the statistics for the day, week, month, or year.

Methodology

At baseline, each participant was given a FitBit Flex to wear for the duration of one week. The goal was to collect 5-7 days of valid data for each participant. Thus, at the end of the

first week of baseline measurement, wear time of the device was checked, and if the individual did not have a minimum of 5 valid days, he or she was asked to wear the device for an additional week. Following the baseline measurement, participants received two physical activity lessons/demonstrations on a Tuesday and Thursday. The Tuesday class focused on discussing the *2008 Physical Activity Guidelines for Americans*, the types and benefits of each type of physical activity, what the guidelines entail for individuals with disabilities, the 10,000 steps a day recommendation, and examples of adaptive exercises for each main part of the body (upper body, torso, and lower body). Particular points regarding participation in exercise were emphasized such as: choosing appropriate exercise for each individual, exercising in a safe environment, what to wear when exercising, and the importance of breathing naturally during exercise. The Thursday class focused on demonstration and participation in physical activity. FUTURE students participated in a serious of static stretches followed by some light physical activity and some muscle-strengthening activities using household items. Due to the various ability levels of the students in the FUTURE program, the aerobic activity focused on simple exercises including: brisk walking, jogging in place, jumping jacks/adapted jumping jacks, basic punches, and high knees. For muscle-strengthening exercises, it was highlighted how individuals do not need to purchase exercise equipment but can use typical items such as cans of food and bottles of water/soda as free-weights. Using canned goods and bottles, the arm, shoulder, back, abdominal, and leg muscles were worked. This was accomplished by doing the following exercises: bicep and hammer curls, triceps extensions, shoulder presses, lateral raises, wide rows, side bends, and squats. Following this exercise session, a verbal and visual recap occurred where each participant was asked to correctly perform an exercise that was executed during the instruction.

Following the week of educational classes, the participants were asked to wear their FitBits for the following week. Due to this week falling over spring break, not all participants wore the device during that week so a second week of follow-up measurement was needed for some. The participants were also asked that they could be sent motivational messages over Facebook Messenger each morning with the goal of promoting regular physical activity. These motivational messages both encouraged taking part in daily physical activity and gave an example of how this can be accomplished. Some examples of the messages sent included (See Appendix B for a complete list):

- "Remember to get your physical activity in for the day! Because it is a sunny and warm day outside, try going outside for at least 30 minutes and going on a brisk walk, a bike ride, or a jog!",
- "Don't forget to be active today! If you go anywhere that involves parking, try to park farther away. If it continues to rain during the day, take breaks from your activities or from watching TV to do jumping jacks, to jog in place, or to work on muscle-strengthening exercises!",
- "Remember that just because you are on break from school doesn't mean you are on break from being active! If you want some new ideas, take a few minutes to look up easy dance workouts or fun adapted exercise videos on YouTube. Try getting your friends or family involved, and follow along with the video while you do the moves!"

Results

One participant was excluded after baseline measurements due to taking greater than 8,000 steps per day, leaving five participants to complete the rest of the study. During the follow-up measurement two participants lost their FitBit devices. Thus, three participants were

included in the final analysis.

For participant A, there was a wide variation of step counts during baseline data collection, ranging from 3642 to 11601 steps per day, with an overall average of 7086 steps per day. During the follow-up phase, this participant showed a more consistent daily step count, ranging from 5851 to 8904 steps per day, with an overall average of 7392 steps per day. (Please reference Appendices C and D for data tables and graphs for this participant.) For participant B, the baseline data collection yielded an average value of 5134 steps per day, with a range of 3214 to 6401 steps per day. During post-intervention, participant B had a daily average of 7637 steps per day, with an accumulated daily range of 4387 to 11360 steps. (Please reference Appendices E and F for data tables and graphs for this participant.) For subject C, baseline data collection yielded an average value of 4534 steps per day, with a range of 1381 to 6835 steps per day. For the post-intervention phase, subject C accumulated an average of 3977 steps per day, with a range of 624 to 9559 steps per day. (Please reference Appendices G and H for data tables and graphs for this participant.)

Discussion

For participant A, the difference between average step counts for the baseline and post-intervention time periods is roughly 300 steps per day. In terms of the relationship between distance and step count, one mile is equal to approximately 2000 steps; therefore, a 300 step increase does not have a substantial impact on overall physical activity. For participant B, the individual accumulated 2500 steps more per day at follow-up than at baseline. This equates to approximately walking an additional 1.25 miles per day and represents a 50% increase in daily activity. In addition, based on the step per day activity level categories, this participant moved from the “low active” category to the “ somewhat active” category (Tudor-Locke & Bassett,

2004, p. 1). Finally, the average step counts for baseline and post-intervention data for participant C had a difference of approximately 500 steps, which like participant A, is not a meaningful increase in activity (approximately ¼ of a mile additional walking per week).

The goal of this study is a critical and pertinent area of investigation especially due to the link with growing trends of obesity and inactivity for individuals with disabilities in the United States (Rimmer, 2008). Increasing the participation for individuals with disabilities is one of the most prominent goals currently for the health and fitness profession (Rimmer, 2005). Often, the health discrepancies that are found in adults with disabilities are not due to the disability itself but instead are because of a lack of health promotion and of overall daily health routines (USDHHS, 2005). In every state, individuals with disabilities report a higher prevalence of physical inactivity; as much as two times greater than those without a disability (CDC, 2006). Due to this large percent of the population being physically inactive, it is essential that society and health professionals recognize the need for physical activity programs, education, and services.

Access should be provided, participation should be increased, and adherence should be promoted in order to address this issue and to positively impact it in today's society (Rimmer, 2008). Not only should there be greater efforts to establish health care settings and to provide equipment, greater strides also need to be made in promoting physical activity for individuals with disabilities (CDC, 2006). Small progressive changes in physical activity could potentially lead to considerable reductions in the prevalence of secondary health problems associated with this population. With continued efforts regarding the education and promotion of physical activity, research studies could positively impact those with disabilities. Future studies should focus on this growing need by using methods such as the ones utilized in this project: the

instruction in a classroom setting, the hands-on implementation and training, and the daily promotion through positive messages of encouragement, illustrations, and education. Through these measures, physical inactivity in individuals with disabilities can be greatly affected and altered.

Limitations

The current study had several limitations. First, participants in this study were also part of another study that involved physical activity goal setting. It is possible that the lack of increase in steps per day is due to the participants reaching their step goal for the other study and not doing more even though they could. Thus, it is possible that the true impact of the educational classes may be underestimated due to the influence of the other study. A second limitation is the small sample size. There was a total of six individuals from the FUTURE program who both agreed to participate in the study and who were physically able to do so. Future studies should focus on recruiting larger, more diverse samples of participants. A third limitation is the short intervention period (1 week) for the educational classes. It would be preferred to have a longer intervention period (e.g. 8-12 weeks), which would allow for more educational time to go into further detail about both physical activity in individuals with disabilities and the resources and programs available for these individuals.

In terms of the post-intervention phase, there were several barriers. Some of these constraints were the fact that the initial time period of data collection occurred over the week of spring break for the FUTURE students. In future studies, it would be advantageous for data collection to transpire for a period of time that can be supervised and that occurs directly after the intervention phase to analyze: 1) if the increase in physical activity decreased or stayed at an increased rate over time and 2) if an increase was due to the intervention period. Due to the first

week of data collection being over the week of spring break, variables such as travel, being in different environments, and not being around peers could have played a role in activity levels. Individuals who had to travel long periods of time may not have been able to participate in physical activity; on a similar note, students who traveled to areas where physical activity was obligatory (e.g., hiking, spending time outside with family, and walking to/on the beach) had levels of physical activity that may not be representative of what a typical week's worth of activity is for these individuals. Also, for individuals who left town or who had friends leave the vicinity, the opportunities for peer-involved physical activity, such as playing basketball, going on a walk/jog together, or participating in any sort of exercise that involves more than one person, decreased significantly.

Conclusion

The purpose of this study was to compare baseline physical activity with post-intervention physical activity that was influenced by peer education and the promotion of physical activity in individuals with disabilities. Due to the small sample size and unforeseeable issues with wearing/losing the activity tracking devices, only a limited amount of data was obtained for baseline and follow-up measurements. Due to this lack of data and the small increase in steps per day, a general conclusion regarding the overall effects of education and promotion on physical activity in this population of interest cannot be reached. In future studies, it would be advantageous to recruit a larger number of participants, to use more user-friendly equipment to measure activity levels, and to allow for longer time periods for baseline, intervention, and follow-up phases. In conclusion, while this study possessed several limitations, it is a step in the right direction for beginning to impact the sedentary lifestyles of individuals with disabilities.

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Appendices

Appendix A. Letter sent home to FUTURE students and parents

FUTURE students and parents,

In order to collect all the needed data for our project, we will be sending FitBits home with students today (Friday March 11) to wear over spring break. Students should wear FitBits every day over break. This includes Saturdays and Sundays! They can take them off to sleep (if they want) or for any activity involving water (swimming/bathing), but the FitBits should be worn at all other times during this break. Students should be reminded to put the FitBits on each morning and should check to make sure they are wearing them each day!

Students will also be sent home with the FitBit chargers. FitBits should be plugged into the chargers Sunday night (March 13) and Thursday night (March 17) before going to sleep and then put back on the next mornings. To charge the FitBits, there is a small battery in the wristband that needs to be removed and then placed into the charging cable. Make sure when these are put into the cable, there is a clicking noise! The other end of the cable will need to be plugged into a USB port; one of the easiest ways to do this is to plug this end into a computer. In the morning, the battery will be charged and needs to be put back into the wristband. Please remember on Monday (March 14) and Friday (March 18) to put the battery back in the wristband!!

Over break, I will be sending the students messages using Facebook every morning. Please be looking for these, and please read them every day. The messages will have something to do with exercise and will be encouraging everybody to be sure to stay active over the break!

If you have any questions, please feel free to let me know! I will be out of the country for the majority of break so the easiest way to contact me will be via Facebook!

Thank you!
Ashley Bordenet
The University of Tennessee
Honors Senior, Kinesiology

Appendix B. List of motivational messages sent via Facebook Messenger during each morning of post-intervention data collection

- **Day 1: "**Remember to get your physical activity in for the day! Because it is a sunny and warm day outside, try going outside for at least 30 minutes and going on a brisk walk, a bike ride, or a jog!"
- **Day 2:** "Don't forget to be active today! If you go anywhere that involves parking, try to park farther away. If it continues to rain during the day, take breaks from your activities or from watching TV to do jumping jacks, to jog in place, or to work on muscle-strengthening exercises!"
- **Day 3:** "Remember that just because you are on break from school doesn't mean you are on break from being active! If you want some new ideas, take a few minutes to look up easy dance workouts or fun adapted exercise videos on YouTube. Try getting your friends or family involved, and follow along with the video while you do the moves!"
- **Day 4:** "Think back to the exercises I taught you last week (jumping jacks, air punches, lunges, squats). Try to fit some of these in your schedule for at least 30 minutes today!"
- **Day 5:** "I hope you are all enjoying your spring break and the good weather outside today! You have been on break for a week now; let's make sure that we are still being active every day. Many of you discussed that you usually walk around campus to get to class. Today's suggestion is to spend some time walking outside, at a gym, or at a local park/greenway. Try to estimate about how long you spend each day walking to and from classes at UT, and try to walk this far or farther today!"
- **Day 6:** "An important aspect of staying active is participating in an activity that YOU like. During our class instruction day last week, you all discussed at least two types of

activity/exercise that you prefer to do. Today, I want you all to do one or both of these activities! Remember that exercise can be enjoyable!"

- **Day 7:** "We are at the end of our week of daily messages today. Similar to yesterday, I want you all to try to have fun during your physical activity today; except today, I want you to try an activity that you have not done in awhile. Think back to activities you did when you were younger: maybe play some hopscotch on the pavement, play some Frisbee, hula-hoop, or jump rope. Try to spend your last day of break with your friends or family, and try to get everybody involved for a day of exercise!"

Appendix C. Baseline and follow-up data table for Participant A

Participant A	
Baseline Data by Date	**Step Count**
Day 1	5269
Day 2	3642
Day 3	4621
Day 4	9236
Day 5	10420
Day 6	11601
Day 7	4815
Follow-Up Data by Date	**Step Count**
Day 1	8372
Day 2	6700
Day 3	8210
Day 4	5851
Day 5	6755
Day 6	7740
Day 7	8904

Table 1. Baseline and follow-up step count data for participant A

Appendix D. Baseline and follow-up visual data graphs for Participant A

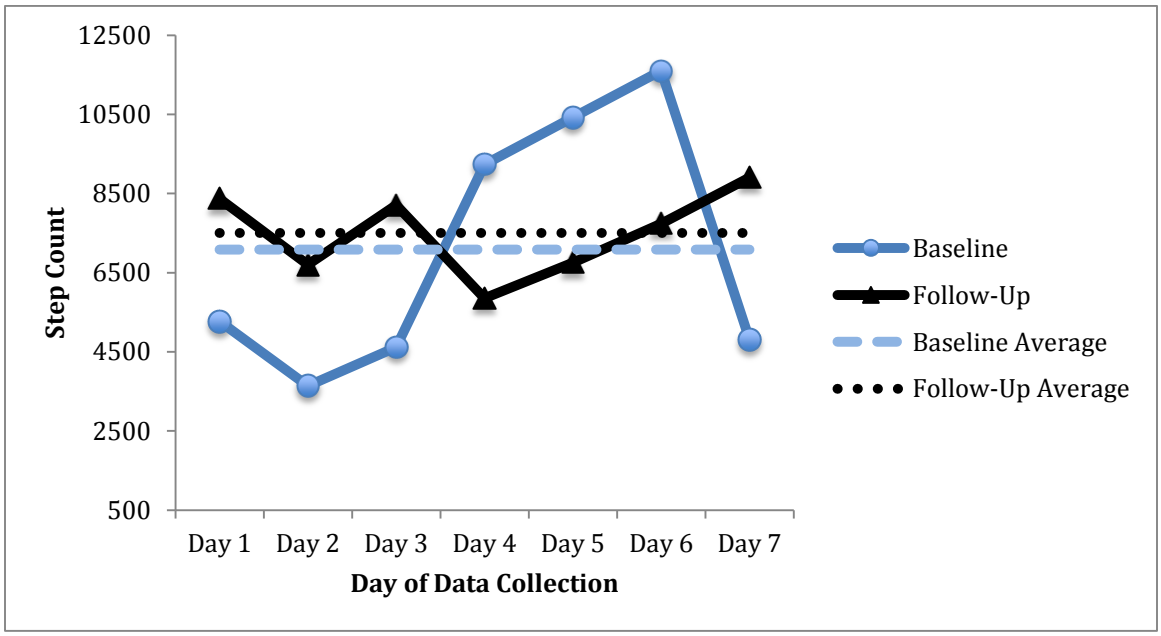

Figure 1. Baseline and follow-up step count data for participant A

Appendix E. Baseline and follow-up data table for Participant B

Participant B	
Baseline Data by Date	**Step Count**
Day 1	3214
Day 2	3316
Day 3	5332
Day 4	6327
Day 5	6401
Day 6	5252
Day 7	6093
Follow-Up Data by Date	**Step Count**
Day 1	6401
Day 2	6480
Day 3	9603
Day 4	4387
Day 5	11360
Day 6	6345
Day 7	8883

Table 2. Baseline and follow-up step count data for participant B

Appendix F. Baseline and follow-up visual data graphs for Participant B

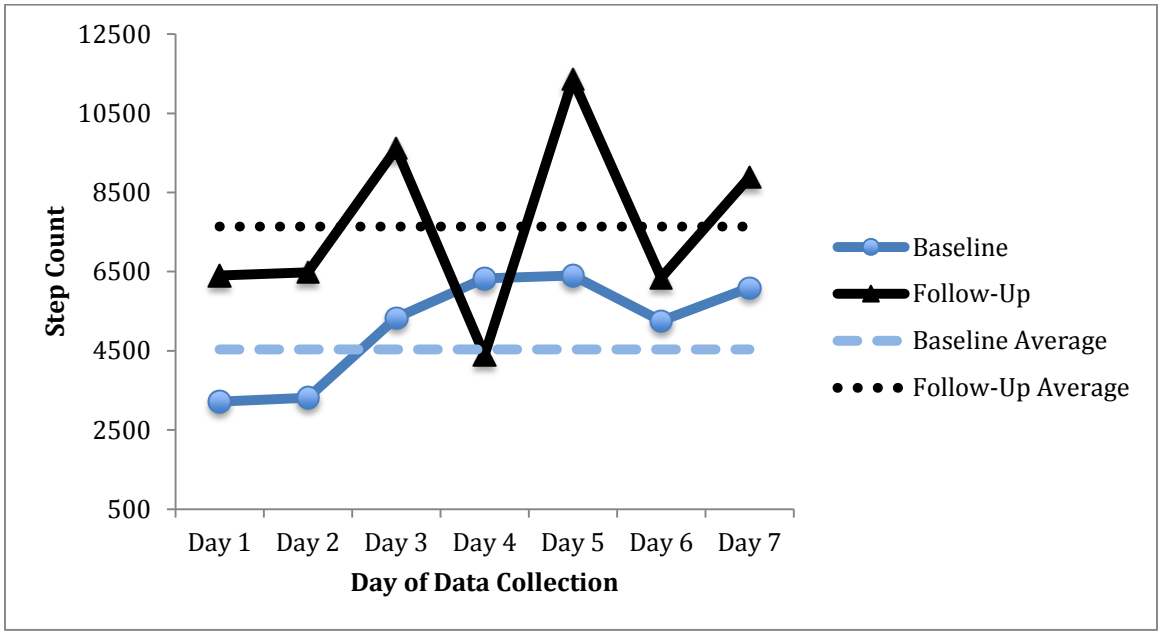

Figure 2. Baseline and follow-up step count data for participant B

Appendix G. Baseline and follow-up data table for Participant C

Participant C	
Baseline Data by Date	**Step Count**
Day 1	1381
Day 2	6835
Day 3	4075
Day 4	6093
Day 5	4284
Follow-Up Data by Date	**Step Count**
Day 1	2424
Day 2	5861
Day 3	1994
Day 4	4661
Day 5	624
Day 6	2713
Day 7	9559

Table 3. Baseline and follow-up step count data for participant C

Appendix H. Baseline and follow-up visual data graphs for Participant C

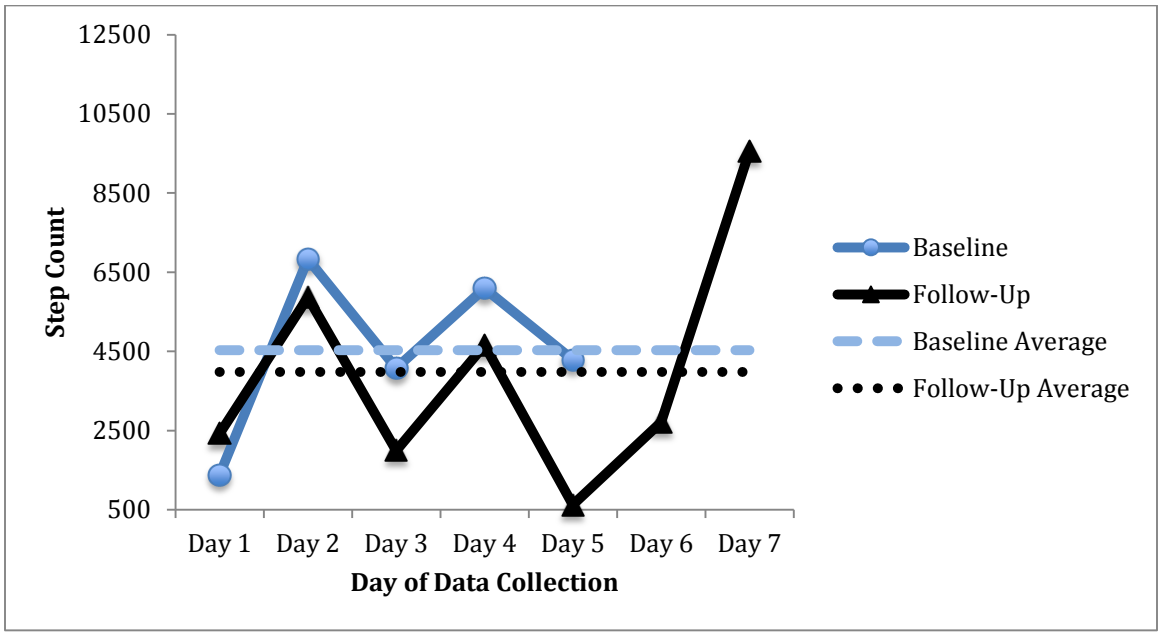

Figure 3. Baseline and follow-up step count data for participant C