

An Evaluation of the Effects of Goal Setting and Feedback on Weekly Running Distance

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Of Master of Science

by

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Abstract

Feedback and goal setting are behavior analytic procedures that can be used to improve individual performance on task completion and habit formation. Feedback in the form of visual graphs can help to both measure performance and determine corrective actions. Goal setting can be used to specifically target performance criteria for optimization and correction. The purpose of this study is to examine the effects of both feedback in isolation and in combination with a goal setting intervention using a multiple baseline across participants design as well as to affirm the usefulness of telehealth as a medium for a goal setting intervention. Participants set a long-term goal to achieve by the end of the study as well as a short-term goal each week. Running distance was tracked using the application Strava. Results indicated that for the majority of participants weekly goal setting increased performance above that of the feedback provided by the application alone and validated the usefulness of telehealth as a goal setting medium.

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List of Abbreviations

ABA
BCBA

Applied Behavior Analysis
Board Certified Behavior Analyst

An Evaluation of the Effects of Goal Setting and Feedback on Weekly Running Distance

Applied Behavior Analysis (ABA) is the application of techniques and theory from the behaviorist branch of psychology to real life situations. To qualify as behavior analytic an intervention must satisfy the seven tenets of behavior analysis identified by Baer et al. (1968) in their cornerstone article “Some Current Dimensions of Applied Behavior Analysis”. These dimensions were generality, effective, technological, analytic, conceptually systematic, applied, and behavioral. Generality meaning that the targeted behavior change must occur not only in a controlled clinical environment but also in other environments such as at school or in the home. To be applied the behavior targeted for change must be socially significant in that it produces a meaningful change to the person’s quality of life. Behavior change is technological if the procedure for the intervention can be written down or otherwise communicated so that it can be replicated with fidelity by future interventionists. To be effective, the behavior targeted must be closely tracked to make sure that the client behavior is changing as a result of the intervention. Conceptually systematic interventions match the theory and concepts from the behavior analytic literature such as reinforcement, punishment, and extinction. Analytic interventions involve the process of taking and graphing data so that it can be visually analyzed to determine the effectiveness of the intervention. To be behavioral an intervention must focus on a behavior that is observable. This helps to avoid explanatory fictions and hypothetical constructs such as “free will” that cannot be proven or disproven.

Applied research has been done on the effects of goal setting and feedback on behavior (Hall et al., 1987; Kyllö & Landers, 1995; Wanlin et al., 1997; Kinigusa et al., 2004, Martin et al., 2004; Page et al., 2020). Both goal setting and feedback are forms of stimulus control

procedures that consist of manipulating antecedent setting events and prompts to impact behavior. Feedback is information about some aspect of performance following the completion of that performance (Cooper et al., 2020) that most often occurs as a verbal description of performance and may function as reinforcement or as a prompt for how to respond the next time. Goal setting consists of picking a target behavior, i.e., the specific behavior selected for change, operationally defining the target behavior and then setting meaningful parameters around when and how the target behavior will be achieved. It has been proposed that goal setting functions as an establishing operation for feedback to be reinforcing by setting the criteria for the level of behavior that is considered successful (Brobst & Ward 2002). With respect to the current study, it is possible runners who use Strava receive feedback, but it may not serve as a reinforcer because the feedback was insufficiently motivating without a prior goal. Without the establishing operation of goal setting the feedback from Strava is just information with limited relevance.

Feedback in the form of the reporting of rate of target behavior or time spent engaged in target behavior may become a reinforcer for the target behavior (Demchak, 1987). Likewise, goal setting can operate as an antecedent that once paired with a reinforcer such as praise gains control over the target behavior (Fellner & Sulzer-Azaroff, 1984). There is some controversy about the effect of subject participation in the goal setting process with some studies finding subject participation to increase the effectiveness of goal setting (Fellner & Azaroff, 1984; Latham & Yukl, 1975; Dickerson & Creedon, 1981; Lovitt & Curtis, 1969; French et al., 1966) and others failing to replicate these results (Latham & Yukl, 1976; Latham, et al., 1978). Overall, the main advantage of participatory goal setting may be program acceptability and maintenance of target behavior after the end of the intervention (Keefe & Blumenthal 1980; Burgio et al., 1983; Dishman, 1991; Johnson et al., 1991).

Goal setting has been used in combination with feedback and praise from supervisors to increase job performance of care home staff with maintenance of target behaviors being seen two years after the conclusion of the intervention (Langeland, et al., 1998). Goal setting has also been used in combination with verbal feedback, graphical feedback, and praise to increase performance of clerical employees as well as employee job satisfaction (Wilk & Redmon, 1998). Wilk and Redmon (1998) found improved performance during the daily goal setting + feedback condition over baseline. They also found graphic feedback more effective at improving performance than verbal feedback, an improvement in job satisfaction after the intervention, and maintenance of target behaviors maintained after the end of the intervention.

Feedback, goal setting, and other behavior analytic interventions effects on physical activity have been researched along two occasionally overlapping branches (Hall & Byrne, 1988; Weinberg, 1994; Killo & Landers, 1995; Normand et al., 2021). The first of these branches was the effect of behavior analytic interventions on athletic performance referred to as sport psychology. Researchers primarily use single subject designs to analyze the effects of interventions on athletic performance (Kinugasa et al., 2004; Martin et al. 2004). Table 1 presents 17 single subject sport psychology studies that used behavior analytic techniques to attempt behavior change related to sport performance. The findings of these studies indicated that the use of behavior analytic interventions such as feedback and goal setting effectively addressed skills across several different sports.

Table 1: Sport psychology research

Citation	Sport	Treatment Package
McKenzie & Rushall, 1974	Competitive swimming	Program board (visual schedule)
Lee, 1988	Field hockey	Goal setting
Weinberg et al., 1991	Motor performance	Goal setting
Swain & Jones, 1995	Basketball	Goal setting
Wanlin et al., 1997	Speed skating	Goal setting
Scott et al., 1997	Track and field	Prompting, shaping
Tenenbaum et al., 1999	Running	Goal setting
Brobst & Ward, 2002	Soccer	Public posting, goal setting, oral feedback
Ward & Carnes, 2002	Football	Goal setting, public posting
Polaha et al., 2004	Swimming	Self-monitoring
Mellalieu et al., 2006	Rugby	Goal setting
Boyer et al., 2009	Gymnastics	Video modeling, video feedback
Stokes et al., 2010	Football	Descriptive feedback with and without video feedback, Teaching with Acoustical Guidance (TAG)
Kaplan-Reimer et al., 2010	Rock climbing	Within stimulus fading procedures, errorless learning, positive reinforcement, error correction, conditional discrimination training
Quinn et al., 2017	Competitive dance	Public posting, feedback, graphical feedback
O'Neill & Miltenberger, 2020	Field hockey	Behavioral skills training

Note. Sport psychology studies pertinent to current research organized by date published.

The second branch of research was on health and endurance referred to as health behaviors. These studies were not particular to any specific sport but rather focused on general health outcomes such as increasing endurance, daily physical activity, or reducing health symptoms. Table 2 presents 16 behavioral health studies that used behavior analytic techniques to increase socially valid behaviors such as daily physical activity. Studies presented by the year they were published to show the evolution of the field. The results of these studies showed that behavioral interventions had a clear impact on aerobic fitness and valid health outcomes. Taken together these behavioral approaches have the potential to reduce medical expenditures and

improve quality of life for millions of people (Raiff et al., 2020). One author suggested some possible future direction for behavior analytic research could be health related interventions and maladaptive behaviors exhibited by individuals with disabilities (Sturme, 2020).

Table 2: Behavioral Health Research

Citation	Health Behavior	Treatment Package
Wysocki et al., 1979	Aerobics	Behavioral contracting
Weinberg et al., 1985	Weight training	Goal setting
Hall et al., 1987	Hand dynamometer endurance task	Goal setting, feedback
Weinberg et al., 1988	Sit ups	Goal setting
Fitterling et al., 1988	Aerobics	Instructions, modeling, behavioral contracting, goal setting, stimulus control, performance feedback, praise, shaping, verbal strategies
Lerner & Locke, 1995	Sit ups	Goal setting, competition
Annesi, 2003	Exercise center attendance	Goal setting, relapse prevention, self-reinforcement, contracting, social support.
Haber & Rhodes, 2004	Brisk walking, resistance bands	Motivation, goal setting, social support, memory techniques, problem solving
Wack et al., 2014	Running	Feedback, goal setting
Carnes & Barkley, 2015	Running	Peer influence
Adams et al., 2017	Steps	Adaptive goal setting, financial incentives
Polgreen et al., 2018	Steps	Automated text messaging, reminders, goal setting
Zarate et al., 2019	Moderate intensity physical activity	Goal setting, textual feedback
Nastasi et al., 2020	Steps per day	Contingency management, token economy
Adams et al., 2021	Daily total moderate to vigorous activity minutes	Adaptive goal setting, financial incentives

Note. Behavioral health studies pertinent to current research organized by date published.

Research into the effects of feedback and goal setting on increasing exercise duration in the neurotypical population began to take off in 2014 with a study published by Wack and colleagues in the *Journal of Applied Behavior Analysis*. This study found that when targeting increased running distance, it was more useful to use weekly running goals than daily quotas,

with a larger number of participants meeting their goals under these conditions. It is important to note that the participants in the Wack study not only had weekly goals but also an even longer-term goal (around 12 weeks) that doubly served as an exit criterion. Important findings from this study included that telehealth options for goal setting did not result in poorer participant outcomes, telehealth options for goal setting were preferred by participants over in-person options, all participants were able to increase their weekly distance over baseline, weekly goal setting was more effective than daily goal setting, and that these outcomes were the result of both goal setting and feedback interventions being used simultaneously.

The 2014 study by Wack and colleagues was the first to use the Nike + Sportkit. Although fitness trackers remain the most common type of technology used for self-monitoring fitness behaviors (Page et al., 2020), the Nike + Sportkit is no longer the most popular application used to measure running distance (Karahanolglu et al., 2021) and is more time-consuming than contemporary fitness monitoring systems such as Strava and other GPS synced fitness tracking systems. To address this limitation of the Wack study it would be useful to test the generalizability of the intervention to a contemporary fitness tracker such as the Strava application.

The Wack et al. (2014) study relied primarily on in-person goal setting sessions which may have limited the generalizability of results due to the inherent inefficiency of travel time that must be factored in for in-person meetings. Furthermore, the effectiveness of textual feedback without goal setting was not studied. It is possible that one of these components was responsible for a greater degree of the changes reported in the study. A final limitation of the Wack et al. study was that the authors did not collect maintenance data after the end of the intervention.

Therefore, to address this limitation of the previous study and provide additional evidence of social significance, maintenance data should be taken as part of the current study.

Since Wack et al. (2014) was published, several other studies have entered the behavior analytic literature and shed light on some of the unanswered questions about goal setting, running and public health. These studies are listed above in Table 2 for reference. Importantly, research since Wack et al. (2014) has shown that financial incentives can have an impact on goal achievement (Adams et al., 2017) which may explain any relationship between having paid for an official race and increased likelihood of completing the exercise plan. Despite a marked increase in published research on behavior analytic interventions on exercise several questions remain unanswered.

The behavior analytic literature suggests that feedback may function in the same way as operant reinforcement (Mangiapanello & Hemmes, 2015). Therefore, the goal setting and feedback sessions at the end of the week conducted in Wack et al. (2014) may have operated as delayed reinforcement for efforts made to run during the week. Future research may find that feedback from a tracking application such as Strava would also function as reinforcement in a similar way. Furthermore, feedback is more likely to function as a reinforcer if there is a motivating operation in effect. A motivating operation both alters the effectiveness of reinforcers or punishers and the frequency of operant response classes related to those consequences (Laraway et al., 2003). In this case, goal setting or having signed up for a race would be the motivating establishing operation increasing the value of feedback as a reinforcer for participants.

Research has shown that when goals are in place and performance feedback is readily available, individuals exhibited stronger performance than when goal setting alone was used for

collegiate football skill execution (Ward & Carnes, 2002; Stokes et al., 2010) and soccer skills of ball possession and field movement (Brobst & Ward, 2002). No studies were found where automated feedback from a tracking application was compared to human generated goal setting with assistance of the use of a tracking application. When goal setting feedback was administered by a member of the research team in combination with a tracking application distance run improved for most participants (Wack et al., 2014). In recent years, the development of more advanced feedback tracking applications raised the question of whether the assistance of another human is necessary to achieve these same results (Karahanoglu et al., 2021). If, as hypothesized by the researchers in this study, the use of a feedback tracking application is as useful as a human generated intervention supplemented by a feedback tracking application, then the automation of goal setting services would be an appropriate public health objective. Secondly, if the usefulness of a telehealth intervention to achieve fitness goals seen previously (Wack et al., 2014; Leblanc et al., 2020) was verified by the study this would also cut costs and improve accessibility of counseling and related services.

In summary, Wack et al., 2014 provided evidence that goal setting and feedback could be used to increase weekly running distance. The study also had the following limitations: the fitness tracker used in the study is not widely used today, the effects of goal setting were not analyzed separately from the effects of feedback, the use of telehealth was not consistent throughout the study, and maintenance data was not taken after the end of the study.

The purpose of this study was to compare the effect of a goal setting plus tracking application intervention to a tracking application alone baseline on weekly running distance and goal completion. A secondary goal of this study was to replicate the findings of previous studies regarding the usefulness of telehealth and contribute to the existing literature regarding the

applicability of telehealth interventions (Leblanc et al., 2020). A tertiary goal of this study that emerged as the study was conducted was to evaluate the effect of having previously committed to running an official distance running event before signing up for the study.

Method

This study was conducted between May and October 2022 with participants from Oregon and Colorado using a telehealth intervention for meetings. The principal investigator was responsible for the data collection which was a mixture of self-report via survey and automated data collection through the Strava application. Prior to implementation, the Oregon Institute of Technology Institutional Review Board approved this study.

Participants and Setting

Four healthy adults aged 23-25 participated in the study. To be included in the study the participants had to be ages 18-55 years, pass the Physical Activity Readiness Questionnaire (Reading & Shephard,1992; Appendix C), own a smartphone, attend a brief 10–30-minute meeting each week, state a desire to increase their running distance, and commit to staying in the study until completion. Participants were asked to continue running where they normally run, including outdoors in rural or suburban settings on trails or sidewalks. Weekly meetings were held with the primary investigator over Zoom.

Jay was a 23-year-old male who had not run previously and expressed a goal of being able to run 4 miles per week within three months. They reported running an average of zero miles per week over the three months immediately preceding the start of the study. They worked full-time remotely.

Alonso was a 25-year-old male who had run a half marathon about a year ago and expressed the goal of being able to run 35 miles per week within two and a half months. They

reported running an average of 10 miles per week over the three months immediately preceding the start of the study. They worked full-time remotely.

Zane was a 25-year-old male who had registered for a marathon at the beginning of October with the goal of being able to run 35 miles per week within three months. They reported running an average of 15 miles per week over the three months immediately preceding the start of the study. They worked full-time in-person.

Tania was 24-year-old women who had registered for a half marathon at the beginning of September with the goal of running 18 miles per week within three months. They reported running an average of between one and seven miles per week over the three months immediately preceding the study. They worked part-time and attended university.

Recruitment

The participants were recruited through a flyer (see Appendix D) which was posted in community areas in Oregon, as a Facebook advertisement, and through the Behavior Analysis in Health, Sport, and Fitness listserv. Both the flyer and the advertisement sought individuals who either ran currently or planned to start running and wanted to increase their weekly running distance. Both the flyer and the electronic version of the flyer described the inclusion/exclusion criteria for the study, the length of the study, the purpose of the study, participation requirements, and who to contact if interested in the study. Participation requirements included: running every week, meeting weekly for no longer than 30 minutes, and participating in an initial meeting with a maximum length of 2 hours.

Measures

Distance Ran

Distance, day, and time for each run was collected. The primary dependent variable was the distance run each week reported as a total number on the Strava application. At the beginning of the study the participants were instructed to add the primary investigator on the Strava application and set their account to private. From then on, the weekly running totals were viewed by the primary researcher at the end of each week and recorded in an excel spreadsheet.

Goals Met

Weekly and long-term goals met were recorded. Each week the participant met with the primary investigator over Zoom for up to 30 minutes to establish weekly goals. During the goal-setting sessions, a SMART goal was set for each week. SMART goals are Specific, Measurable, Attainable, Realistic, and Timely. In addition, there is some evidence as to how the difficulty of the target goals impacts the attainment of those goals. Specifically, constraining the goals to be simultaneously challenging and attainable is thought to help facilitate the attainment of target outcomes (Locke & Latham, 2002). By comparing the data from the previous week with the SMART goal set at the end of the previous goal setting session the PI decided if the previous goal was met or not. If the goal was met it was marked as met and dated. Then the PI and the participant collaborated to set a new weekly goal. If the goal was not met it was marked as not met in an excel document and dated. Then the PI and the participant went back through the goal setting procedure and either decided to keep the same goal or change the goal (e.g., by lowering the difficulty). Participants also set a long-term goal during the initial meeting to achieve by the end of the study and whether this goal was achieved was recorded.

Interobserver-Agreement

Interobserver-Agreement (IOA) was assessed for 100% of weekly running distances across all four participants and was 100%. IOA was performed by having two independent observers (the participant and the primary investigator) record the week and the total distance ran that week as reported by the Strava application. Agreement was recorded in a binary fashion as either a “yes” or a “no”. In order to qualify as an agreement both the week and the number of miles ran had to match exactly. IOA was calculated by taking the number of opportunities for agreement and then dividing by the total number of agreements and multiplying by a factor of 100.

Questionnaires

PAR-Q

A seven-question physical activity readiness questionnaire (Thomas et al., 1992) was used to screen participants to ensure they had not been recommended against physical activity by a doctor due to a heart condition, experienced pain in chest when engaging in physical activity, lost balance or consciousness due to dizziness, had a bone or joint condition that could be made worse by exercise, were currently prescribed drugs for blood pressure or heart condition, and did not have any known reasons not to engage in exercise before beginning the study (see Appendix C). Questions targeted health factors that could worsen because of a sudden increase in exercise such as blood pressure, chest pain, loss of consciousness, heart conditions, and bone/joint issues. If the participant responded “yes” to any of the questions on the PAR-Q they would have been disqualified from entering the study. Previously, the PAR-Q had been used in Wack et al. (2014) to qualify participants in a study that involved increasing weekly running distance and none of the participants reported being injured.

Screening Questionnaire

In response to the email received per the flyer/Facebook advertisements request, the researcher sent the participant a pre-study questionnaire (see Appendix E). This questionnaire included questions about the participants running history, current/anticipated schedule, and desired outcome from participating in the study. This pre-study questionnaire served the dual purpose of identifying goals as well as starting points and potential conflicts. Examples of potential conflicts that were listed included scheduling conflicts around work or vacation, weather issues, and medical issues that may require accommodation to complete the study.

Follow Up Questionnaire

Approximately one month after completing or terminating their participation in the study a follow-up questionnaire was sent out to the participants to assess their perception of the study and measure participant satisfaction. The questionnaire consisted of 14 total items, with eight statements to be rated on a five-part scale with the values of strongly disagree, disagree, no opinion, agree, and strongly agree. One item was also rated on a five-part scale with the values of mostly negative, somewhat negative, neutral, somewhat positive, and mostly positive. All questions that featured a five-part rating scale also included a blank area for the respondent to elaborate on why they rated the statement the way that they did. The remaining items included two yes/no questions, two fill-in-the-blank items where the participant was asked to fill in estimated miles run prior to or after the study, and one open-ended item. See appendix E for a full view of the Follow-up Questionnaire.

Materials

Subjects were asked to track their exercise on a mobile app (Strava) which required a smartphone. Strava application was downloaded on a smartphone that used GPS to track distance traveled.

Experimental Design

A changing criterion within a non-concurrent multiple baseline design across participants was used to assess the effects of the addition of a weekly goal setting intervention to pre-existing Strava application usage on both weekly running distance and acquisition of weekly target goals. A multiple baseline across participants consisted of a staggered baseline and intervention phase across participants to demonstrate control of dependent variable by independent variable manipulations (Cooper et al., 2020).

Procedure

Initial Meeting

Following the response to the survey, participants were sent a copy of the PAR-Q. If their answers indicated the intervention was not likely to be dangerous, an initial meeting was scheduled. During this initial meeting (up to 2 hours), participants were provided with a copy of the consent form (Appendix F), study procedures were explained, and questions about the study were answered. Then, the participant was asked to set a long-term goal of how many miles they would like to run in a week by the end of the study. If they did not already use Strava, the PI modeled how to use the application using screen sharing and coached the participant through the process of recording a run using verbal instruction. The PI then told the participant that the primary investigator will be directly viewing data on their exercise through the Strava application and instructions for using the Strava app were provided. They were instructed to use

the Strava application to track their activity when they went for a run and all participants verbally confirmed logging all baseline running activity with the PI after completing baseline.

Baseline

Baseline data were collected following the initial meeting; baseline data collection lasted a minimum of three weeks for each participant. During this phase participants were told that the intervention would not begin for a few weeks, but that if they chose to run to bring their smartphone and activate Strava for the entire duration of their run.

Goal Setting Intervention

The independent variable in this study was a goal setting session that took place once a week. Once stable state responding had been achieved and about a week before the participant was selected to begin the intervention the researcher contacted them to schedule a time for the first meeting. During the first meeting an initial long-term goal was created, reviewed, and confirmed by the participant. Zoom meetings were scheduled weekly at times convenient to both the participant and the researcher. The meetings lasted between 15 and 30 minutes and averaged approximately 20 minutes in length. They were conducted to check up on current progress, set the next weekly goal, troubleshoot issues, and answer questions. Typically, if the participant did not meet their previous goal, they brainstormed with the researcher about how they could reach the goal next week and/or lower their weekly goal. If they did reach their weekly goal, they could either keep their goal the same or increase their target weekly running distance. On some occasions where a participant anticipated adverse weather, experienced an injury, was traveling, or was tapering for a race they would decrease their next weekly goal despite having met their previous week's goal.

Individual goal setting sessions began by reviewing the data (on Strava) from the previous week to see if the goal had been met. If the goal had been met the primary investigator and the participant collaborated to set a new goal for the next week starting with the number of miles intended to run. After deciding on how many miles they would attempt to run they would then state which days they planned to do their runs and brainstormed possible obstacles to completing the participant's weekly goal as well as possible strategies to circumvent or mitigate those obstacles. Blank form can be viewed as a part of Appendix A and the filled-out goal setting sheet from the study can be seen in Appendix B (University of Washington, 2019).

Maintenance

Maintenance was assessed one month after the termination of the intervention with a question in the follow-up questionnaire. Distance run during the maintenance phase was collected from Strava during the 4-6 weeks after the completion of the study.

Results

Overall results of the goal setting intervention were varied across participants. Three of the four participants increased their weekly running distance during the goal setting intervention. The participant who did not meet their goal terminated their participation three weeks into the intervention due to time constraints and an injury. One of the participants met their long-term goal by the end of the study, one participant increased their original long-term goal and met that increased goal, and one participant adjusted their goal by changing the criteria from running to walking and met their adjusted goal by the end of the study. Participants met their weekly running goals on 32/42 possible opportunities (76%). There was considerable variation across participants when it came to completing their weekly running goals with Tania meeting 13/13 (100%) of her weekly goals at the high end and Alonso meeting one of two goals (50%) of his goals at the low end. Note that the goals were not always achieved in a strictly linear fashion with each participant setting some short-term goals lower compared to previous weeks to account for events such as weather (Tania on the first week of September), travel (Alonso on the second week of June), injury (Zane on second week of July), and work stress (Jay on final week of July). Weekly distance and goals for each participant are presented in Figure 1.

Jay was the first participant to begin the intervention. He began the week of June 6th and set the long-term goal of running 4 miles a week by the beginning of August. As can be seen in Figure 1, Jay had their long-term goal adjusted on the week of August 4th after failing to meet weekly goals for four consecutive weeks. Originally Jay had the goal of running 4 miles a week, but it was adjusted at the beginning of August to walking 2 miles a week for 2 consecutive

weeks. From this point on Jay was walking and not running to achieve their goal. Jay was able to meet the adjusted goal 8 weeks later. Over the course of the study, they met their weekly goal on 11 out of 17 opportunities or approximately 65% of opportunities. The elevated level of walking exhibited by Jay during the intervention was maintained for 1 week after the completion of the intervention before he stopped walking.

Alonso was the second participant to begin the intervention. He began the week of June 13th and set the goal of running 35 miles a week by July 20th. Alonso did not meet his long-term goal, although he did meet weekly goals on 1 out of 2 opportunities or 50% of opportunities. Possible reasons for why Alonso did not make his weekly goals included a vacation on week one of the intervention and an injury that took place on the third week of the intervention. Although Alonso was able to hit his previous weekly goals, Alonso terminated participation after the third week of the intervention. No further data on weekly running distance was collected from Alonso.

Tania began the intervention on the week of July 4th with the goal of running 20 miles a week by September 4th. This goal was adjusted on August 9th to a goal of running 22 miles in a week by September 4th. The adjusted goal was met on the final week of August. They were able to meet their weekly goals on 13 out of 13 opportunities or 100% of opportunities. Tania's elevated levels of weekly running distance were apparent over 1 month into maintenance after the completion of the intervention.

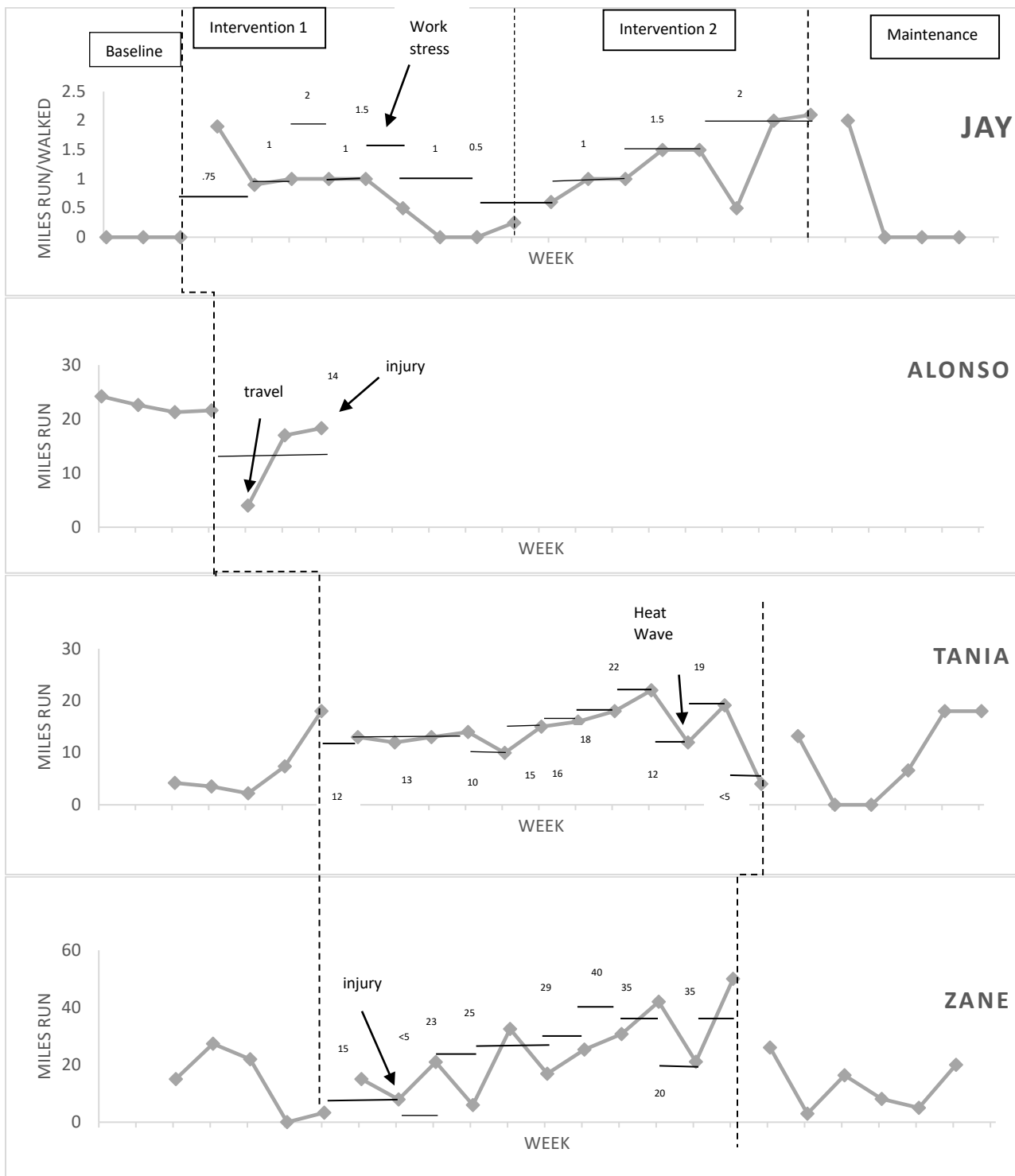


Figure 1.: Graph of Intervention Effects Across Participants

Note. Solid black lines and small numbers on graph indicated weekly goals, confounding factors such as injuries, harsh weather, and other stressors also labeled on graph.

Zane also began the intervention on the week of July 4th. Zane set the goal of being able to run 35 miles a week by the end of September. Zane reported a possible overuse injury on the 11th of July which resulted in them altering their short-term goal to running less than 5 miles the next week but did not result in Zane altering their long-term goal. Zane was able to meet their long-term goal on the week of the 29th of September. Note that since Zane did not run less than 5 miles on the week of July 11th, they did not meet their goal that week. Thus, they were able to meet their weekly goals on 7 out of 11 opportunities or approximately 64% of opportunities. Zane’s running behavior maintained at similar levels to those exhibited during the baseline condition after the conclusion of the intervention.

Table 3: Results of Follow-up Questionnaire -Items 1 - 8

	SD	D	NO	A	SA
1.I enjoyed participating in this study				1	3
2.I am happy with the overall results I achieved as a part of the study				2	2
3.The goal setting procedure helped to keep me motivated throughout the study				2	2
4.Meeting each week provided value on top of using Strava				2	2
5.Strava was a beneficial way to keep track of my distance				1	3
6.I ran more as a result of the study than I did previously			1	2	1
7.I plan to keep running even after the study concludes	1				3
8.I would recommend this procedure to others who want to increase weekly running distance.			1	1	2
	MN	N	NO	SP	MP
My overall Opinion of the study:				1	3

Note. SD = strongly disagree, D = disagree, NO = no opinion, A = agree, SA = strongly agree, MN = mostly negative, N = negative, SP = somewhat positive, and MP = mostly positive

As indicated in Table 3, most participants agreed or strongly agreed with the follow-up survey statements regarding the social validity of the intervention. One participant strongly disagreed with the statement “I plan to keep running even after the study concluded”, a second participant had no opinion in response to the statement “I ran more as a result of the study than I did previously” and had no opinion in response to the statement “I would recommend this

procedure to others who want to increase weekly running distance”. In response to questions about publicly posting running data (items 11 and 12), three of the four participants indicated that they had previously posted publicly. All participants indicated that they posted their running data during their time in the study, and this was confirmed by viewing the Strava accounts of the four individuals in the study during the time of the study. Participant free responses from the Follow-up Questionnaire are provided in Appendix H.

Table 4: Results of Follow-up Questionnaire Items 9 -10

	In the three months leading up to my participation in the study I ran an estimated average of _____ miles each week	In the month after my participation in the study I ran an estimated average of _____ miles each week
Tania	1-7	5
Alonso	1-10	1-10
Zane	15	15
Jay	0	0

Note. Table 4 indicated the self-reported running activities of all four participants both before and after data was automatically taken during the intervention.

Table 4 presented participant estimates of their average miles run before and during the study. Responses indicate that the participants did not see a difference in their weekly running data before the introduction of the goal setting intervention or after the conclusion of the goal setting intervention.

Discussion

The purpose of the present study was to evaluate the effect of a goal setting intervention in addition to the use of a tracking application on weekly running distance. This research contributed to the existing research literature on the effects of goal setting and graphic feedback

on fitness goals. Specifically, the study sought to replicate the usefulness of telehealth options for goal setting described in Wack et al. (2014) and to determine if weekly goal setting sessions created value in addition to the value created by the feedback from a fitness tracking application. Furthermore, this study collected maintenance data that was not collected in previous studies in order to examine the long-term social validity of the intervention (Wack et al., 2014). Results confirmed the usefulness of telehealth as a medium with three of the four participants achieving their goals by the end of the study. Results also extended evidence for the social validity of fitness tracking devices as all four participants indicated that the application Strava was a beneficial tool to keep track of their running distance. Furthermore, the study provided evidence that weekly goal setting was a value-added procedure on top of just the use of a tracking application because although two of the four participants maintained their weekly running distances, none of them improved their weekly running distance after weekly goal setting was removed from the intervention. Possibly explanations for these findings are provided in the discussions section below.

This study was the first to expand the use of a single-subject design to evaluate an intervention to increase weekly running distance from the Nike + Sport kit to the Strava android application. The Strava android application is the most commonly used method of tracking running performance in the United States (Karahanoğlu et al., 2021). An advantage of using a fitness tracker is that self-reports do not have to be collected from the participant, making this method of data collection more reliable than other methods. All four participants either somewhat agreed or strongly agreed that the Strava application was useful in tracking their data, with one participant responding, “I liked the weekly total feature of Strava which other apps do not provide.”. This finding validated previous findings where tracking applications were rated as

a useful way to track physical fitness. All participants either agreed or strongly agreed that meeting each week provided value on top of using Strava and that the goal setting procedure helped to keep them motivated throughout the study. The combination of physical activity data and follow up questionnaire responses indicated that both the usage of the tracking application Strava and the weekly goal setting helped to increase weekly running distance in the participants.

The value of weekly goal setting was further supported by two additional pieces of information. First, the miles logged in Strava during the maintenance condition did not exceed the weekly miles run at the end of the intervention for any participant. Second, none of the participants reported increased running distances after the conclusion of the study as compared to the three months prior to the study in the follow up questionnaire. Since the participants still had access and were using the tracking application after the conclusion of the study this indicated that the goal setting intervention was likely effective in causing the elevated weekly running levels observed during the study when conducted with the help of the PI. One caveat to this would be that Tania did log numbers on Strava during maintenance that were close to but did not exceed her peak running distance during the intervention. This was a possible indicator of natural reinforcers taking over the maintenance of the weekly running behavior from the contrived motivating establishing operation of goal setting with the help of the PI.

Furthermore, while only one of the four participants had previously posted publicly data from Strava, both self-report data from the follow up survey and data from Strava indicated that the practice of publicly posting run data may have been acquired by all participants during the study. Although participants were instructed to set Strava to private they reported posting publicly in the follow up survey which indicated that either the question was not worded clearly enough in the follow up survey or there was procedural drift in this aspect of the study. Further

research is also needed to evaluate the effects of public posting of exercise data on weekly running distance as the participants were not asked to publicly post data and the degree to which this activity was engaged in was assessed only at the end of the study as part of the follow-up questionnaire. Either way, the results suggest that the goal setting intervention functioned as an establishing operation for weekly running distance as three out of the four participants were able to meet their goal during the intervention. One participant stated in response to the follow up questionnaire “I like that I had to be accountable to someone if I did or did not meet my goal for that week. Just using Strava would not have proved that.”

It should be noted that the intervention was altered for one participant (Jay) who did not meet their running goal for four consecutive weeks. This alteration was to change the exercise intensity criterion from running to walking. Once the change was made, Jay was able to meet their goal. Before participating in the study Jay had not done any distance running since graduating high school more than 5 years prior. Without an established habit of regular exercising or a specific establishing operation like having signed up for a race which was the case for Jay, additional support would be needed for a fitness intervention. One promising solution for individuals with sedentary lifestyles would be to use a health contract in combination with social support which has been shown to be successful in increasing exercise (Haber & Rhodes, 2004).

One participant, Alonso, did not have any weeks during the intervention where their total weekly miles run was higher than in baseline. This was likely a result of the matching law which described the tendency of a person provided with two or more different schedules of reinforcement to allocate responding between the schedules in proportion to the amount of reinforcement yielded by each schedule (Cuvo et al., 1998). For Alonso, the reinforcing

effectiveness of running and meeting running goals may have become less valuable due to an injury and job-related stressors. Becoming injured may have made running less reinforcing than other activities that did not agitate the affected area and thus he may have been less likely to allocate time toward running in favor of other activities. During this time Alonso also became dissatisfied with their current job and began looking for new opportunities, as a result searching for a new job likely became more reinforcing due to the potential reward of a higher paying job or superior career opportunities.

Although most of the participants met their goals during the study and two of the participants continued using Strava during the maintenance phase, it is important to note that participant self-report data from the follow up questionnaire indicated a lack of maintenance of the intervention effect on total weekly running distance after the conclusion of the study. In fact, all four participants reported running similar amounts prior to the study as they did during the month after the intervention concluded. Furthermore, data collected by the Strava application confirmed this self-report data for three of the four participants. Therefore, it is likely that once the goal setting intervention was removed that the behavior of using Strava remained, but the behavior of running at an elevated level did not maintain. It is important to note that the participants were asked how much they ran in the three months prior to the study after the maintenance phase had concluded. Future studies should consider collecting self-report data on prior activity before beginning the study when self-report is less likely to be clouded by the passage of time. This would give us more information to discern what the true baseline of participants was prior to regular tracking of their running data on Strava.

Furthermore, the non-maintenance of elevated running level after the removal of the goal setting intervention provided evidence that the goal setting meetings were the causal variable

behind elevated running distance during the study and not the tracking application. More robust maintenance of weekly running distances may be achieved by increasing the duration of the criteria for reaching a goal to three consecutive weeks instead of one to two weeks. Also, although the average weekly distance run was not higher the month after the end of the intervention than it had been prior to the intervention both Tania and Zane showed an initial decrease in running distance for four-five weeks followed by an uptick in weekly running distance. This could have represented a recovery period after hitting their original long-term goal followed by a return to baseline levels after the naturally occurring reinforcer replaced the socially mediated reinforcement from weekly meetings. A four-to-five-week interval may have been what it took for the weekly fixed interval reinforcement of the meetings to become no longer expected by the participants and replaced by the original natural reinforcement schedule.

In future research the effect of committing to a running event on distance ran would further expand the literature. During this study, three of the four participants cited their desire to run an official race as part of their motivation for participating. Two of these participants were looking to run a marathon and the other a half marathon. Of these, two of them met their goal. For these participants, it is probable that receiving weekly feedback that they were on track in their preparation for their race would have had extra reinforcing value considering the financial costs of registering for official half/full marathons.

Further research should investigate the effect of withdrawing a socially mediated reinforcer on weekly running distance. Since Tania and Zane both took similar times to return to baseline running behavior after the end of the intervention it would be worth the time to investigate the size and scope of this recovery phenomenon to expand the research on maintenance of physical exercise interventions.

In conclusion, the results of this study showed both empirical and anecdotal evidence for the use of weekly goal setting as a useful addition to the performance feedback generated by the Strava application. Further evidence from the follow-up questionnaire supported the conclusion that the participants found the application useful and there was limited success (50%) in maintaining the usage of the application after the study. A limitation of the study was that since the running distances reported before the use of the Strava application were self-reported these numbers could not be validated by the researchers. Furthermore, although it was found that all four participants reported engaging in publicly posting their exercise data during the study it is not clear what role this had in increasing weekly running distances, if any.

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Appendix A: Blank Goal Setting Form

Be **specific** about **what** you'll do and **when**, plan for any **obstacles**, and check that each step is **"SMART"** (specific, measurable, appealing, realistic, and time-limited). **TIP:** If you're not at least 90% confident you can follow through...change it up! Make a more solid plan or pick something else.

Plan	Is this step "SMART"?
WHAT I WILL DO: WHEN I WILL DO IT: POSSIBLE OBSTACLES: HOW TO OVERCOME THEM:	
.....HOW DID IT GO?	

<https://depts.washington.edu/uwhatc/PDF/TF-%20CBT/pages/combined/CBT+-GOAL-SETTING-Worksheet.pdf>

Appendix B: Example Filled Out Goal Setting Form

Be **specific** about **what** you'll do and **when**, plan for any **obstacles**, and check that each step is **"SMART"** (specific, measurable, appealing, realistic, and time-limited). **TIP:** If you're not at least 90% confident you can follow through...change it up! Make a more solid plan or pick something else.

Plan	Is this step "SMART"?
<p>WHAT I WILL DO: 23 miles / 4 hours + 1 hour for transitions</p> <p>WHEN I WILL DO IT: work out, Leg day Friday. Long run on Wednesday. Short run 3 miles every other day (suggestion)</p> <p>POSSIBLE OBSTACLES: Building the running schedule into the lifting schedule.</p> <p>HOW TO OVERCOME THEM: Get scheduling soon.</p>	
<p>.....HOW DID IT GO?</p> <p>Ran 32.5 miles and the goal was hit.</p>	

<https://depts.washington.edu/uwhatc/PDF/TF-%20CBT/pages/combined/CBT+-GOAL-SETTING-Worksheet.pdf>

Appendix C: PAR-Q

This PAR-Q "Physical Activity Readiness Questionnaire" is for your personal use only. It does not need to be signed and returned to SBCC. Please read the questions carefully, answer them honestly, and consider the recommendations for your personal safety. Thank You!

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before starting to become much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
<input type="checkbox"/>	<input type="checkbox"/>	1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by your doctor?
<input type="checkbox"/>	<input type="checkbox"/>	2. Do you feel pain in your chest when you do physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	3. In the past month, have you had chest pain when you were not doing physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
<input type="checkbox"/>	<input type="checkbox"/>	5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
<input type="checkbox"/>	<input type="checkbox"/>	7. Do you know of <u>any other reason</u> why you should not do physical activity?

**If
you
answered**

YES to one or more questions

Talk to your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want – as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful to you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- Take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- If you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- If you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____

DATE _____

SIGNATURE OF PARENT _____

WITNESS _____

Or GUARDIAN (for participants under the age of majority)

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

Appendix D: Recruitment Flyer



**Goal Setting to
Increase Weekly
Running Distance**

**Looking to INCREASE
your Running DISTANCE?
Participate in a Research Opportunity!**

**Purpose: Analyse Effects of Goal
Setting Intervention on Weekly
Running Distance**

**To participate:
Be between 18-55 years old, own a smartphone, pass
physical activity screening, state a desire to increase
running distance, and be able to commit to weekly
meetings for up to 12 weeks**

**For more information please contact the principal investigator
conducting this research : Camden J. Wulf camden.wulf@oit.edu**

Appendix E : Pre-study Questionnaire

Screening Questionnaire

How many times do you run in a typical week?

How far do you run in a typical week?

What is the farthest distance you have run in a single run in the last year?

Write in times that would work for you to run during the week. *Ex. 2-4pm*

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Time							

Do you have any current running goals?

Do you foresee any major obstacles in achieving those goals? What are they?

What motivates you to run?

Appendix F: Consent Form

OREGON INSTITUTE OF TECHNOLOGY

Consent Form Template

Research Project Title: Addition of Goal Setting to Fitness Tracking Application Effect on Weekly Distance Run

Principal Investigator: Camden J. Wulf

Phone # 503-516-0919

Email: camden.wulf@oit.edu

Description of the study and its purpose:

The purpose of this study is to compare the effect of a goal setting plus tracking application intervention to a tracking application alone on weekly running distance and goal completion.

Explanation for why the subject is specifically being recruited for this study:

We are asking you to consider being a part of this study because you responded to a flyer or other recruitment effort by indicating a desire to be part of a research project to increase the distance you run weekly. We expect between two and six people to participate in this study.

Criteria which would exclude a subject from being able to participate in this study:

Under age 18

Over age 55

Has pre-existing medical condition that could be exacerbated by physical exercise.

Does not own a smartphone.

Cannot attend a brief 10–30-minute meeting each week.

Not able to commit to weekly meetings for up to 12 weeks.

Does not state a desire to increase their running distance.

Answers yes to any of the Physical Activity Readiness Questionnaire (PAR-Q).

Alternatives to study participation:

An alternative to participating in this research is not participating.

What exactly the subject is consenting to and for how long (including start and end date of participation):

All participants will be asked to subscribe (free) to the tracking application Strava and record their running each week to be shared with the head researcher. They will also be expected to set distance

running goals each week as well as a long-term goal for the end of the study. The participant will be consenting to participating in an outdoor running intervention where their data will be collected and shared with the researcher and the researcher's advisor. Time commitment will include an approximate 2-hour meeting at the beginning of the study to make sure the participant understands what they are consenting to and one 30-minute meeting each week for up to 12 weeks (after baseline is concluded). Meetings will be conducted remotely. Participants will also be committing to run regularly, which I estimate could take between 2 hours a week and 20 hours a week depending on participant running level. Once de-identified data may be published in a scientific journal.

Benefits of the study, if any, to subjects:

There are no guaranteed benefits to you as a result of your participation in this study, but we hope that the data collected will benefit the larger community by adding to the existing knowledge about increasing exercise duration. You may experience some benefits such as uplift in mood, and higher level of respiratory fitness that are correlated with increased physical activity (CDC, 2010).

Specific risks of the study, if any, and the likelihood of these risks harming subjects (including any financial costs for participating):

The risks or discomforts from your participation in this study are unlikely but include that you could become injured while running outside, that you could suffer a heart attack or stroke as the result of an unforeseen underlying health condition, that you could become embarrassed by leaking of your private information and that you could become embarrassed or experience emotional pain as the result of not reaching their goals.

Any financial reward or other incentives for participating:

You will not be paid for participating in this study.

Any financial or other costs for participating:

There will be no costs to you.

Explanation for how subject data will or will not be (a) kept confidential (e.g., how it will be de-identified and protected), (b) stored (e.g., hard copies in locked filing cabinet in locked office), (c) stored for how long before being destroyed (including start and end date of storage), and (d) disseminated/shared (e.g., presented at a conference or submitted for publication):

To the extent allowed by law, every effort will be made to keep your personal information confidential. Records that identify you and the consent form signed by you may be looked at by representatives of Oregon Institute of Technology, regulatory agencies, the Institutional Review Board, and the Biomedical Research Alliance of New York. While these parties are aware of the need to keep your information confidential, total confidentiality cannot be guaranteed. The results of this research may be presented at meetings or in publications; however, you will not be identified in these presentations or publications. All data will be coded with pseudonyms so that the participant cannot be identified by any presentation of data in meetings or information seized during a cyber-attack. Physical data will be stored for 7 years in a locked box in a locked office and then destroyed permanently by a HIPPA compliant record destruction service. Electronic data will be stored for 7 years in a password protected

file on a password protected laptop and deleted permanently afterward.

Explanation of subject’s rights related to (a) voluntarily participating in the study, (b) not be penalized for electing to not participate in the study, (c) being able to withdraw from the study at any time without penalization, and (d) the specific procedure/steps for how a subject can withdraw from the study:

Participation is completely voluntary. If you do not take part in the study or decide to discontinue your participation, there will be no penalty to you. If you don’t take part, it won’t affect any benefits to which you are entitled. If those conducting the study think it’s not in your best interest to continue or decide to stop the study, we will end your participation. To express your desire to withdraw from the study please contact the primary researcher Camden J. Wulf at the email address

Camden.wulf@oit.edu. After contacting the primary researcher, you will receive an email recognizing that you have chosen to withdraw from the study and asking you whether the primary investigator has your consent to use the data collected thus far. If you do not reply or answer no to this survey your data will not be used and will be destroyed immediately.

If a subject has any questions about the nature of this study, they can contact the principal investigator listed above.

If you have any questions about your rights as a research subject or complaints regarding this research study, or you are unable to reach the research staff, you may contact a person independent of the research team at the Biomedical Research Alliance of New York Institutional Review Board at 516-318-6877. Questions, concerns, or complaints about research can also be registered with the Biomedical Research Alliance of New York Institutional Review Board at www.branyirb.com/concerns-about-research.

**Signing below indicates you have read and understand the above information and voluntarily consent to participate in this study.*

Typed or Printed Name of Subject

Signature of Subject

Date

Typed or Printed Name of Person Obtaining Consent

Signature of Person Obtaining Consent

Date

Appendix G: Follow Up Questionnaire

Follow Up Questionnaire (adapted from Wack et al)

Please rate the following:

1. I enjoyed participating in this study.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
2. I am happy with the overall results I achieved as a part of the study.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
3. The goal setting procedure helped to keep me motivated throughout the study.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
4. Meeting each week provided value on top of using Strava.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
5. Strava was a beneficial way to keep track of my distance.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
6. I previously publicly posted my running data.
 Yes No
7. I publicly posted my running data during the study.
 Yes No
8. I run more because of participation in the study than I did previously.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:
9. In the three months leading up to my participation in the study I ran an estimated average of ___ miles each week.
10. In the month after my participation in the study I ran an estimated average of ___ miles each week.
11. I plan to keep running even after the study concludes.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree
Why:

12. I would recommend this procedure to others who want to increase weekly running distance.
 Strongly Disagree Disagree No Opinion Agree Strongly Agree

13. My overall Opinion of the study:

Mostly Negative Somewhat Negative Neutral Somewhat Positive Mostly Positive

Explain:

14. What did you Like Most/Least about the Study? Any Recommendations?

Appendix H: Free Responses from Follow Up Questionnaire

Free Responses from Follow Up Questionnaire

Question	
I enjoyed participating in this study:	“The study was enjoyable”
I am happy with the overall results I achieved as a part of the study	“I am happy with the study because I achieved goal”
The goal setting procedure helped to keep me motivated throughout the study	“Weekly increments building toward bigger goal”
Strava was a beneficial way to keep track of my distance	“Strava was quite useful”
I ran more because of the study than I did previously	“I set a goal and sought to achieve it. However, I feel that if I had set the same goal outside of the study, I would have achieved similar results. That said, the structure of the study helped me work towards my goal.” “Helped goal setting”
I plan to keep running after the study concludes	“I run often, regardless of whether I have a goal set.” “Running helps me mentally and physically.”
What did you like most/least about the study? Any recommendations?	“I felt that my running improved by participating.” “Communication was sufficient throughout the process and weekly meetings were productive and efficient. Glad to be a part of the study.”
Overall Opinion of the Study?	“I had a great time and am glad I participated.” “Great study, helped motivate and track progress”
Meeting each week provided value on top of using Strava	“Helped build discipline.” “I like that I had to be accountable to someone if I did or did not meet my goal for that week. Just using Strava would not have proved that”

Note. Appendix H consisted of actual responses to the free response parts of the follow up questionnaire picked to illustrate the general attitude of subjects in the study.