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Using a Goal-Setting and Feedback Procedure to Increase Running Distance

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by

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ABSTRACT

Goal-setting procedures have been employed in many different sports, and have been shown to be a beneficial component for enhancing sports performance. For this study, a changing-criterion within multiple-baseline design was used to evaluate a multi-component intervention for increasing running distance for five healthy adults. The intervention consisted of goal setting with performance feedback. Participants set a short-term goal each week and a long-term goal to achieve upon completion of the study. The study incorporated the use of the Nike™ + SportKit for automated recording of the distance of each run. Results of the current study demonstrated for all participants that goal setting and performance feedback was an effective method to enhance sports performance for individuals wanting to increase their running distance.

INTRODUCTION

In order to achieve optimal health, the Centers for Disease Control and Prevention (2010) emphasizes the need for individuals to engage in physical activity for at least 30 min on most days of the week. The potential benefits, such as weight control, muscle strength, cardiovascular health (Keefe & Blumenthal, 1980), life extension, and mental wellness (Dishman, 1991) outweigh the potential risks, such as injury, disease, and obesity, which could result from not exercising ("Physical Activity for Everyone: The Benefits of Physical Activity," 2010).

The first sports article using a single-subject research design was published in the *Journal of Applied Behavior Analysis* in 1974, and since then sports research has expanded greatly with each year thereafter (Martin, Thompson, & Regehr, 2004). In less than 40 years, research in the field of applied behavior analysis and sports has had a substantial effect on enhancement in athletic performance and an increase in physical activity for youths and adults (Martin et al., 2004).

Behavioral interventions have many practical advantages for shaping competence, maintaining existing talent, and generalizing proficiency to competitive environments (Martin et al., 2004). Throughout the 1980's and early 1990's, a significant number of sports journals, books, and conferences helped to elucidate the necessity of interventions to enhance athletic performance (Martin et al., 2004). Behavioral contracts, stimulus control procedures, goal-setting methods, and feedback are some of the behavioral interventions used in single-subject research to promote a healthier lifestyle and to boost skill acquisition for athletes.

A behavior contract is comprised of a written agreement between two parties that signifies the behavior intended for change, how the individual will accomplish the change, and the consequence that will follow if he or she does meet the agreement outlined in the contract (Haber & Rhodes, 2004). In a study done by Wysocki et al. (1979), participants who wanted to increase their exercise met weekly in order to sign contracts and to deposit items of personal importance for the upcoming week. If the individual met criterion level of exercise then the deposited items were returned. Participants continued to deposit items as others were returned. These continuing deposits ensured that the individuals would not withdraw from the program, because, if dropout did occur, the items were relinquished (Wysocki et al., 1979). Results from this study demonstrated the efficacy of behavior contracts used to improve physical activity. Fitterling, Martin, Gramling, and Cole (1988) also used a behavioral contract procedure with a response cost component in which participants initially deposited $100. Each time the participant adhered to their exercise regimen, five-dollar increments were refunded from their initial deposit. If the participant failed to meet the exercise criterion they had one chance to make it up the following day in order to receive a three-dollar refund. Exceeding or falling below criterion level resulted in the participant forfeiting their money for that session.

Stimulus control procedures consist of antecedent and setting event manipulations along with stimulus prompts. Stimulus control procedures have been used to endorse exercise in inactive adults (Haber & Rhodes, 2004), to encourage children diagnosed with autism to engage in leisure activities (Kaplan-Reimer, Sidener, Reeve, & Sidener, 2010), and to improve performance in track and field for an athlete (D. Scott, Scott, & Goldwater, 1997). In a study conducted by Keefe and Blumenthal (1980), a

stimulus control procedure combined with self-reinforcement was employed. Participants were instructed to participate at a similar time and setting each day, stretch prior to exercise, and set goals at reasonable levels in order in increase their frequency of exercise. Results from this study showed that once the intervention was initiated levels of exercise for all three participants increased and maintained over a two-year period. Haber and Rhodes (2004) also employed stimulus control procedures such as leaving prompts in highly visible locations, using a calendar to record exercise goals, and having an individual remind participants to exercise each day.

According to Wanlin, Hrycaiko, Martin, and Mahon (1997), an effective motivational method to boost performance is the application of a goal-setting procedure. Setting goals is a motivational technique to foster improvement in various settings with an assortment of tasks (Hall, Weinberg, & Jackson, 1987). Since the early 1970's, goal-setting procedures have been used in organizational environments to increase task performance and have demonstrated efficacy (Hall et al., 1987). Researchers have employed goal-setting procedures in sports including soccer (Brobst & Ward, 2002), football (Ward & Carnes, 2002), rugby (Mellalieu, Hanton, & O'Brien, 2006), and field hockey (Lee, 1988) in order to enhance both individual and team performance. Results from these studies suggest that goal-setting procedures are beneficial in enhancing sports performance, and coaches, athletes, and fitness educators have started using goal-setting techniques in sport and exercise settings (Weinberg, 1994).

Goal-setting procedures set criterion level for each individual's behavior (Brobst & Ward, 2002) and may provide a sense of empowerment to the individual setting the goal (Haber & Rhodes, 2004). Studies conducted by Fitterling et al. (1988) and Wysocki et al. (1979) utilized the Cooper exercise program. Cooper Points (aerobic points) are

based on how much oxygen is consumed during specific exercises. For example, if an individual runs one mile in eight min and then runs the same distance in 15 min, the number of Cooper Points provided would be higher for the run with the shorter duration. The reason a higher value of Cooper Points would be supplied for the first run is because that run had a higher intensity level (greater oxygen consumption) than the second run. In both studies, participants set a goal of how many Cooper points they would aim to earn each week. The participant chose which exercise they wanted to engage in, how long they wanted to partake in the exercise, and what consequence would result for achieving or not achieving their set goal. Both of these studies demonstrated the significance of setting individual goals and also showed the importance of having set consequences for target behaviors.

Various studies (Kyllo & Landers, 1995; Weinberg, 1994) have also examined goal proximity (short-term vs. long-term goals). Results from both of these goal-setting studies demonstrated the value of goal-setting procedures. Weinberg (1994) concluded that having long-term goals is more beneficial in improving overall performance than no goals at all. Whereas, Kyllo and Landers (1995) suggested that both short and long-term goals are important in goal-setting procedures because short-term goals provide the opportunity for immediate reinforcement and feedback, whereas long-term goals provide an outcome for the individual to target.

According to Locke's goal-setting theory, establishing a "specific hard goal would produce higher levels of performance" than easy "do your best", or unattainable goals (Locke & Latham, 1985). To test this hypothesis, Weinberg, Bruya and Jackson (1985) randomly assigned students to one of four conditions to measure the frequency of sit-ups completed in three min. In three of these conditions, participants had a specific and

difficult goal, while the fourth group was just told to "do your best". Data were taken over five weeks, and the results showed no significant difference among the conditions. However, Weinberg, Bruya, Longino, and Jackson (1988) extended a similar study over a 10-week period, and concluded that the people in the specific goal condition performed better than the people in the "do your best" condition. Locke and Latham (1985) hypothesized that the set goal should be realistically attainable—though, still difficult—so continuing failure would not hinder the individual's motivation. A study was conducted to test this hypothesis. Weinberg et al. (1991) assigned individuals to various levels, ranging from easy to impossible goal attainability. One part of the study looked at how many sit-ups a child could do, while the other part looked at how many basketball shots a college student could make. The results demonstrated that the level of difficulty for the goal did not affect commitment. According to Lerner and Locke (1995), results showing that goal specificity and goal difficulty are important contributors to the goal-setting procedure hold most consistent when the participants are given performance feedback concerning their progress.

Several studies verified that when goals were in place and performance feedback was provided, the individual performed better than when goal setting alone was used (Brobst & Ward, 2002; Stokes, Luiselli, Reed, & Fleming, 2010; Ward & Carnes, 2002). Performance feedback allows an individual to see the progress he or she is making toward the goals (Locke & Latham, 2002), and as allows for modifications, if necessary. Without an individual receiving feedback on performance it may be less likely that the individual will make adjustments to meet set goals. Performance feedback via public posting (Brobst & Ward, 2002; McKenzie & Rushall, 1974; Polaha, Allen, & Studley, 2004; Ward & Carnes, 2002) and video review (Boyer, Miltenberger, Batsche, & Fogel,

2009; Stokes et al., 2010) were the procedures used most in sports interventions. Performance feedback may be beneficial because it allows the individual to contact socially mediated reinforcement each time he or she engages in the appropriate behavior. Two studies utilized video feedback and modeling in order for individuals to compare their own athletic skills to those of experts in an effort to improve athletic performance (Boyer et al., 2009; Stokes et al., 2010). Boyer et al. (2009) showed that video modeling with video feedback bolstered gymnasts' skills more than routine practice and coaching instructions. Furthermore, Stokes et al. (2010) demonstrated the importance of both descriptive and video feedback in improving football skill performance.

Incorporating applied procedures to boost performance in sports has been gaining popularity throughout the years, but research on running has rarely been studied. In research by Wysocki et al. (1979) on increasing physical exercise, adults actually chose to run when given the choice of which activity to engage in. Even more surprisingly, 90% of the group's total Cooper Points value came from running. Out of all the research reviewed on enhancing athletic performance, only one study was found which looked at using a goal-setting procedure to increase running speed for athletes (Tenenbaum, Spence, & Christensen, 1999). The researchers addressed the goal-attainability hypothesis discussed by Locke and Latham (1985), which theorized that individual performance is more likely to improve when a goal is set at a difficult, but realistic level, rather than an improbable or easy level. According to a percentage of weekly improvement, participants were split into three separate groups: easy, difficult/realistic, or difficult/unattainable. Because short plus long-term goals have been shown to enhance performance (Kyllo & Landers, 1995), Tenenbaum et al. (1999) gave

each runner a short-term goal to accomplish each week and a long-term goal to complete at the end of the four-week intervention. The long-term easy goal was a 5% improvement from baseline, the difficult/realistic goal was a 10% improvement from baseline, and the difficult/unattainable goal was a 15% improvement from baseline. The results demonstrated that regardless of the level of difficulty each participant achieved their set goal. Furthermore, these results did not support the goal-attainability hypothesis proposed by Locke and Latham. Due to the conflicting conclusions regarding goal specificity and goal difficulty, it may be important to address these ambiguous results in future research on sports performance and goal-setting procedures.

Much of the research reviewed on sports performance addressed an entire team or group using group design, rather than individual performance (including the Tenenbaum study). It has been suggested that when concentrating on overall team improvement it is important to set goals at certain levels for each athlete in order to target the individuals' different levels of skill (Weinberg, 1994). Single-subject research designs can be more beneficial than the group design because of their flexibility and because they provide the opportunity for individual data-based decision making, and should be most often used when dealing with individual performance (Kinugasa, Cerin, & Hooper, 2004). No published studies could be found that evaluated interventions for improving running distance using a single-subject design. The purpose of the current study was to examine the effects of goal setting and performance feedback on increasing running distance for healthy adults. The study addresses the existing limitations in the sports performance literature by assessing the effects of both short-term and long-term distance goals on individual running performance. This study also incorporated the use of the Nike™+ SportKit, which has not been used in prior research, to provide automated recording of running distance rather than reliance on the runner's self-recording.

METHOD

Participants and Setting

Five healthy female adults, ranging in age from 18 to 28 years, participated in the study. Two of the participants (Amye and Evan) were college students at the university, and the other three participants (Kelsey, Mary, and Jackie) were university graduates who worked in the area. Based on the responses from the pre-study questionnaire, all of the participants expressed an interest in becoming healthier, improving appearance, and increasing endurance. Running episodes varied for each participant and occurred either on a treadmill, indoor track, or outdoor running trail.

Amye was a 25-year-old who was 165.1 cm tall and weighed 61.7 kg. According to the body mass index (BMI) scale, a BMI of below 18.5 falls in the underweight category, 18.5-24.9 is considered normal, 25-29.9 is considered overweight, and a BMI of 30 or more is considered obese ("Calculate Your Body Mass Index", 2012). Consistent with the BMI scale, Amye had a BMI of 22.6, so she was in the normal weight category. Prior to the study she specified that she typically ran two to three times per week and between two and four miles per day. However, she wanted to increase her distance up to six miles. Amye also noted, in the pre-study questionnaire, that the farthest distance she recently ran was four miles in approximately 43 min.

Evan was an 18-year-old who was 155 cm tall and weighed 70.3 kg. Her BMI was 28.9, so according to the BMI scale she fell in the overweight category ("Calculate Your Body Mass Index", 2012). Evan stated that the farthest she ran before the study began was .2 miles. She also mentioned that she currently did not run, but had a goal of

running one mile without stopping at the conclusion of the study.

Mary was a 27-year-old who was 160 cm tall and weighed 69.4 kg. Mary's BMI was 25.8, so she was categorized as overweight according to the BMI scale ("Calculate Your Body Mass Index", 2012). Prior to the study, she specified that she typically ran one or two times per week and ran intervals equaling between one and two miles on each occurrence. She stated that her mile run averaged 12 min. Mary said that her personal record for a three-mile run was approximately 35 min, and her ultimate goal was to be able to run three miles in under 30 min by the conclusion of the study.

Jackie was a 26-year-old who was 178.3 cm tall and weighed 58.5 kg. Her BMI was 18.5, and according to the BMI scale she fell in the underweight category ("Calculate Your Body Mass Index", 2012). Prior to the study, she said that she typically ran three times per week and between two and three miles per day. Jackie stated that her main goal was to increase her speed (pace per mile), and theorized that her pace would improve as her endurance increased. Her best time for three miles was accomplished in approximately 30 min. Her long-term goal was to be able to run six miles without stopping and complete a three-mile run in less than 30 min.

Kelsey was a 28-year-old who was 61.3 cm tall and weighed 64.4 kg. Kelsey's BMI was 25.2, and was considered overweight according to the BMI scale ("Calculate Your Body Mass Index", 2012). Before the start of the study she stated that she did not run, but would like to start running during the week. Kelsey also said that she could run about half a mile without stopping, and would like to be able to run two miles by the end of the study.

Recruitment

The participants were recruited through a flyer (see Appendix A) posted around

the dorms, library, and gym on a university campus located in Florida. The flyer sought individuals who ran regularly or had planned to start running, and wanted to increase their endurance. The flyer detailed the approximate length of the study and who to contact if they were interested in being a part of the research. Also included on the flyer was a list of inclusion and exclusion criteria for participants.

Inclusion and Exclusion Criteria. Participants were only selected into the study if they were in good current physical health, did not have any conditions that would pose health risks or risks for injuries after engaging in exercise, and had a motivation to increase their running distance. Participants needed to be able to attend a brief (10-15 min) meeting each week and commit to staying in the study for the entire duration. Lastly, each participant needed to be capable of running a minimum of three times per week according to his or her individual schedule.

Participant Questionnaires. Those who were interested in becoming a part of the study e-mailed the experimenter, per the flyer's request. Upon receiving the e-mail, the experimenter sent out a pre-study participant questionnaire (see Appendix B). This questionnaire consisted of a variety of questions that targeted the participant's running history, ideal outcome for engaging in exercise (i.e. becoming healthier, losing weight, gaining muscle, improving appearing, building endurance, etc.), preferred running terrain, current height/weight, and typical weekly schedule. The purpose of the pre-study questionnaire was for the researcher to identify goals, starting points, and potential conflicts that may arise during the study.

The application of a motivational questionnaire was also included within the pre-study questionnaire in order to establish each participant's current stage of change according to the Transtheoretical model ("Exercise: Stages of Change-Short Form").

Self-motivation is an indicator for program success, so determining each individual's current stage of change helped to indicate those most likely to adhere to the program (Annesi, 2003). From what was reported on the motivational questionnaire, three participants marked that they "have been exercising regularly for more than six months" (maintenance stage), and two participants marked that they "have been exercising regularly for less than six months" (action stage). According to the Transtheoretical model ("Exercise: Stages of Change-Short Form"), the maintenance and action stages demonstrate intent to continue exercising on a regular basis. Finally, as a preventative health procedure the Physical Activity Readiness Questionnaire (see Appendix C) (PAR-Q; Thomas, Reading, & Shephard, 1992) was administered in conjunction with the pre-study questionnaire to determine each individual's medical wellness.

Seven questions made up The PAR-Q and were used to screen each participant for health risk factors, and to ensure that each person was in good physical health before starting exercise. Questions targeted heart conditions, chest pain, loss of consciousness, bone and joint problems, and blood pressure, which are all complications that could be exacerbated with sudden physical exercise. If a participant answered, "yes" to any of the questions on the PAR-Q they were not included in the study. Furthermore, if a participant was included in the study and at any time expressed a health concern or injury the experimenter recommended that a break was to be taken until the injury pain diminished or health prevailed. No participants were asked to withdraw from the study due to injury or illness.

Materials

Following admission into the study each participant received a training packet and various running equipment at the initial meeting. The running equipment included a

Nike™ + SportKit and Nike™+ sensor pouch. Additionally, an e-mail with the Nike™+ User Guide was also sent to each participant. The user guide explained how to properly activate and use the Nike™+ SportKit.

Training Packet. The training packet consisted of a spiral bound booklet containing information about the study, a copy of the informed consent form, blank weekly data sheets, and some websites to reference regarding running. The page containing information about the study listed the purpose of the study and briefly described the rules that were detailed in the consent form. The page of websites contained several helpful running websites (e.g. runningintheusa.com; runnersworld.com; mapmyrun.com; active.com). The compilation of websites offered information on how to stretch properly, what to eat before and after a run, places to run nearby, upcoming races, proper running attire, and other useful running tips.

Running Equipment. Running distance (miles) was recorded using the Nike™+ SportKit during each running episode. The Nike™+ SportKit consisted of the Nike™+ SportBand and Nike™+ sensor. The sensor pouch was not included within the SportKit, but was a necessary accessory for the study. The sensor pouch was to be placed between the laces in the left shoe, and for the most precise recording, participants were instructed to place the Nike™+ sensor in the sensor pouch with the red Nike™ sign side facing toward the sky in order to achieve the most accurate calculations of distance ("Nike™ + iPod: User guide," 2010).

Prior to calibration, the accuracy of each run is estimated to be around 90%, and following calibration it is between 90%-100% ("Nike™ + iPod: User guide," 2010). The Nike™+ SportBand allowed participants to toggle through their distance, pace, and duration in order to receive digitally displayed feedback throughout their run ("Nike™ +

iPod: User guide," 2010). Once the run was completed, participants could then plug the SportKit into a USB port, and the data would automatically import onto the nikerunning.com website. Once the data were imported, researchers and participants could then evaluate their performance history by seeing the total distance of each run, calories burned, and duration of each running episode ("Nike™ + iPod: User guide," 2010).

Data Collection

The primary dependent variable in the study was distance per running episode (miles). A running episode was defined as a continuous run, according to the Nike™+ SportKit, at a speed typically faster than the individual's walking pace.

Inter Observer Agreement

Interobserver agreement (IOA) was assessed for 100% of the runs across all five participants and was 96.7% (range of 91.4% to 100%). IOA was performed by having two independent observers (the researcher and the participant) record the date (mm/dd) and the distance (mile) per running episode. For three participants, the date and the distance were reported from looking at the data that were recorded on the Nike™ website. For two participants, the date and distance were reported from looking at the Nike™+ SportBand data, in addition to the data that were recorded on the Nike™ website. The date and distance that were recorded had to be exact for an agreement to occur. Agreement was recorded as either a yes or a no. An IOA score was calculated by taking the number of opportunity for agreements divided by the number of total agreements and then multiplied by 100.

Procedure

Following initiation into the study, a date and time was discussed via email in

order to set up an initial meeting with each participant. In the initial meeting, the experimenter supplied the participant with a training packet and running equipment. Instructions were provided to the participant on how to use the Nike™ + the SportKit and how to place the Nike™ sensor correctly in the shoe. Additionally, the experimenter demonstrated how to program the SportKit into the nikerunning.com website and helped each participant register on the site. The experimenter told each participant that they would be contacted (via e-mail) within the next few weeks to set up a meeting time in which she would set both her short and long-term goals. The study procedures were explained during this initial meeting and questions were answered.

Baseline. Baseline data were collected following the initial meeting; baseline data collection lasted between two and four weeks. During this phase the participants were told that the study would not start for a few weeks, but if they chose to run beforehand they were asked to wear the Nike™ + Sport Band during each run.

Intervention 1. The independent variable in the study was a goal-setting procedure combined with performance feedback. Approximately one week before the intervention began the researcher contacted the participant in order to schedule a time and place to meet for the first meeting. Long and short-term goals were set at the first meeting following baseline. The short-term goal was the goal each participant wanted to accomplish each week and was set at each weekly feedback meeting. Each participant was required to run a minimum of three times per week and could only set a higher goal for the upcoming week if she completed at least two runs during the week at, or above, the set criterion level. Additionally, the most recent run recorded before the meeting could not fall below criterion level. Once the participant accomplished the short-term goal for the week she was then permitted to set a new higher goal for the next week. In

order to refrain from injury, the experimenter suggested that the set goal not exceed a half-mile increase from the previously met goal. If the participant did not meet the set goal then she could choose to either remain at the same level for another week, or lower her goal. The long-term goal was the total distance (miles) that the participant wanted to be able to run by the conclusion of the study.

Meetings occurred on a weekly basis in various locations on campus or in the community according to both the participant and researcher's availability. Approximately 25% of the meetings were conducted electronically via Skype if either the participant or the researcher could not meet in person. The meetings lasted, at most, twenty min, and were conducted to check up on weekly progress, set new goals, resolve issues, answer questions, and provide visual and descriptive performance feedback to the participant. The visual feedback was a graphical display of their overall progress, and the descriptive feedback was a verbal explanation of their progress and suggestions for ways to improve. Participants were asked to upload their runs onto nikerunning.com prior to the weekly meeting, so both the experimenter and the participant, upon logging onto nikerunning.com, could review the data. If the participant met the necessary criteria then she was provided the opportunity to set a new goal for the upcoming week.

Intervention 2. Due to competing contingencies (i.e. school, work, other activities, etc.) a failure to meet criterion on multiple occasions resulted in an alteration to the intervention for three participants. A goal-setting and performance feedback procedure was still incorporated, but the short-term goal was changed to an overall weekly running distance (miles) for the participants. This modification made it possible to include several runs in a day and did not require a minimum number of runs per week. The long-term goal was the number of miles that each participant wanted to be

running on a weekly basis by the conclusion of the study. Similar to the previous intervention, each participant had to meet or exceed criterion a minimum number of times before setting a new short-term goal. Running distance had to be at, or above, criterion for at least two weeks before setting a new goal and the last week could not fall below criterion level.

Experimental Design

A changing criterion within a non-concurrent multiple-baseline design across participants was used to assess the effects of a goal setting with performance feedback intervention for each participant.

Social Validity

The researcher developed a social validity questionnaire (see Appendix G) that was provided at the end of the study in order to assess each individual's overall opinion of the intervention. The results of the social validity questionnaire are reflected in Table 1.

RESULTS

Data reflecting the effectiveness of the goal-setting and performance feedback procedure are depicted in Figures 1 and 2 for Amye and Evan and Figures 3 and 4 for Mary, Jackie, and Kelsey. All four figures show distance across days and/or weeks. Figures 2 and 3 represent the initial intervention that was put into place for all participants. Failure to meet criterion for two weeks (Figure 3) resulted in the modified intervention (i.e. Treatment 2) for Mary, Jackie, and Kelsey, which is represented in Figure 4. Figures 1 and 4 illustrate overall weekly distance throughout the duration of the study across all five participants. Descriptive data for each participant are reported in Table 2.

Table 1. *Participant Short-term Goal Data*

Week	**Amye**		**Evan**		**Mary**		**Jackie**		**Kelsey**	
1	3.5	✓	.5	✓	.3	✓	3	✕	.3	✕
2	4	✓	.8	✕	.5	✕	2.5	✕	.3	✓
3	4.3	✕	.5	✓	.4	✓	4	✓	.5	✕
4	4	✕	.6	✓	.8	✕	4	✓	1	✓
5	4	✕	.7	✓	.5	✕	5.5	✓	1	✓
6	3.8	✓	n/a	n/a	1.5	✓	5.5	✓	2	✓
7	4.8	✓	n/a	n/a	1.5	✕	7	✓	n/a	n/a
8	5.3	✕	.8	✓	1.5	✓	7	✓	2	✓
9	n/a	n/a	**end**	---	3	✓	n/a	n/a	3	✓
10	5.3	✓	---	---	3	✓	7	✓	3	✓
11	n/a	n/a	---	---	4.3	✓	**end**	---	3	✓
12	n/a	n/a	---	---	4.3	✕	---	---	**end**	---
13	6	✓	---	---	4.3	✓	---	---	---	---
14	6	✓	---	---	5	✓	---	---	---	---
15	**end**	---	---	---	5	✓	---	---	---	---
16	---	---	---	---	5	✓	---	---	---	---
17	---	---	---	---	**end**	---	---	---	---	---

Table 2 indicates each participant's short-term goal that was determined on a weekly basis. If the participant met, or exceeded, the set goal for that week a check mark is displayed next to the weekly goal, but if the goal was not met an "X" is shown. Short-term goals were met 75% of the time across all five participants (Amye: 64%; Evan: 83%; Mary: 69%; Jackie: 78%; Kelsey: 80%). The columns with the gray shading are the data prior to the intervention adjustment for the three participants. Mary and Jackie did not meet their short-term goals on two consecutive weeks due to competing contingencies (i.e. work and other leisure activities), so they were given the decision to change their short-term goal to an overall weekly running distance. This option was later extended to Kelsey, because she stated that she preferred to run multiple times in one day, and the initial study rules stated, "only the farthest running episode per day would count towards the week's goal." Although Amye failed to meet criterion on several occasions, the modified intervention was not extended to her because this alteration was not decided until she was six weeks into the first intervention. If Amye failed to meet criterion for two consecutive weeks following week six, the modified intervention option would have been offered to her. Short-term goals were met 92% of the time (Mary: 82%; Jackie: 100%; Kelsey: 100%) across all three participants following this modification. The weeks in which "n/a" is specified were weeks that the participant did not set a short-term goal due to obligations, vacations, and/or sickness. A goal was not set for weeks nine, eleven and twelve for Amye and weeks six and seven for Evan due to school finals and vacation. Jackie was out of town during weeks nine and ten, and Kelsey was sick during week seven. Mary was available to meet and set a short-term goal every week throughout the study.

Although the study was not altered for two participants, Figure 1 demonstrates the overall weekly distance results from baseline and intervention for Amye (top panel) and Evan (bottom panel). For Amye and Evan overall weekly distance was on an upward trend once the initial intervention was introduced.

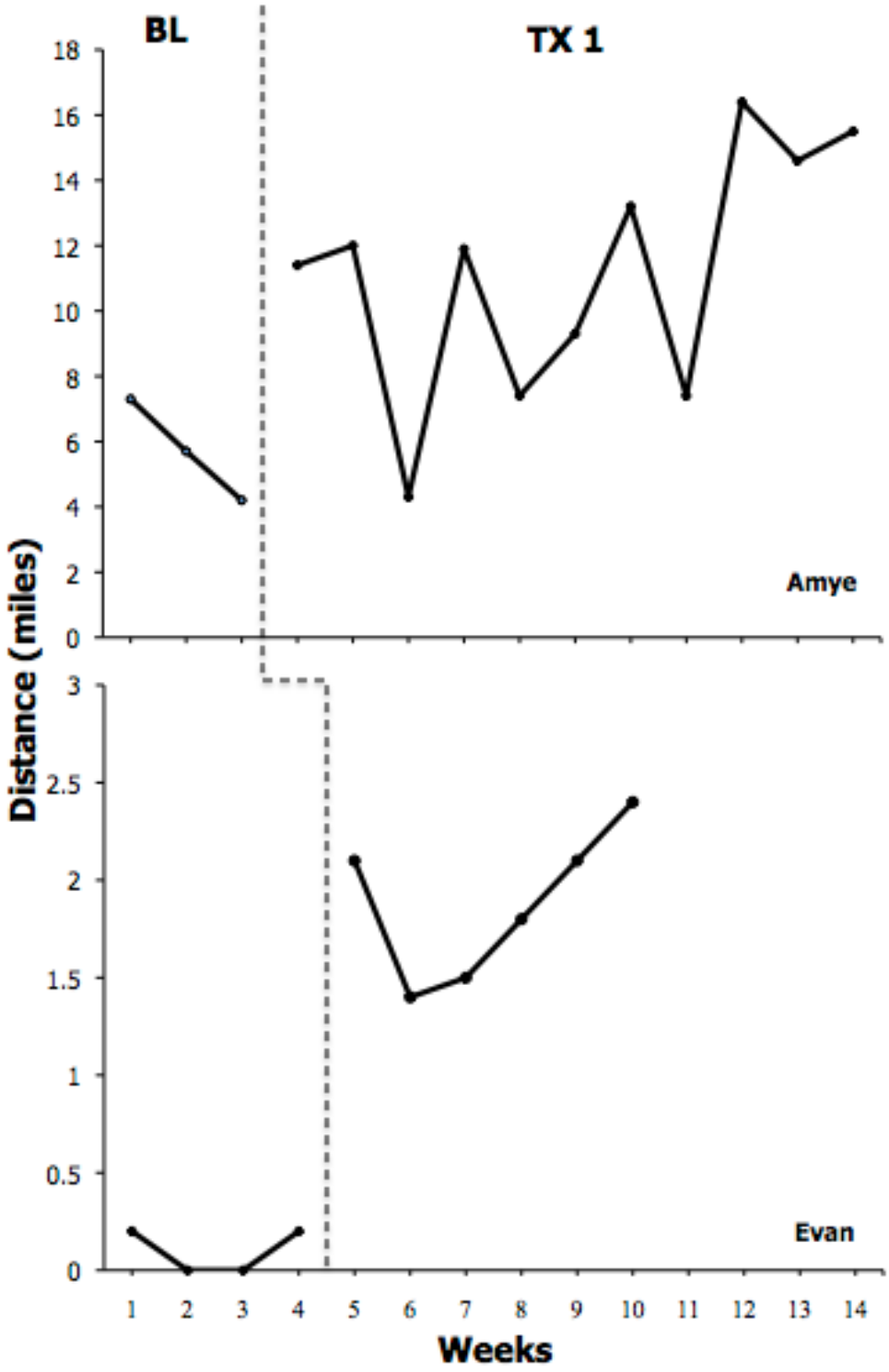

Figure 1. Overall weekly baseline and intervention results for Amye (top panel) and Evan (bottom panel).

Figure 2 shows the baseline and first intervention results for two participants. Amye (top panel) was in baseline for a total of 23 days (approximately three weeks). During the first week of baseline she ran twice. The first run was 3.6 miles and the second run was 3.7 miles. The second week had two runs, 3.3 and 2.4 miles. The remainder of baseline (nine days) consisted of one 4.2 mile run. Her baseline average per running episode was 3.4 miles. At the first meeting following baseline, Amye decided that her long-term goal was going to be six miles. She met her long-term goal in 11 weeks. Baseline data were taken for Evan (bottom panel) for 28 days (four weeks). She ran twice during baseline, and both runs were .2 miles. Her baseline average per running episode was .2 miles. At the initial meeting after baseline, Evan established a one-mile long-term goal. Evan was in the study for six weeks, but had to drop out for personal reasons. Prior to dropping out she ran three consecutive running episodes at .8 miles. Although Evan dropped out of the study at week eight, nikerunning.com indicated that she ran a single run of .9 miles during week nine and a single run of 1 one mile at week ten. These data are not reflected in the figures because no goals were set during either of these weeks.

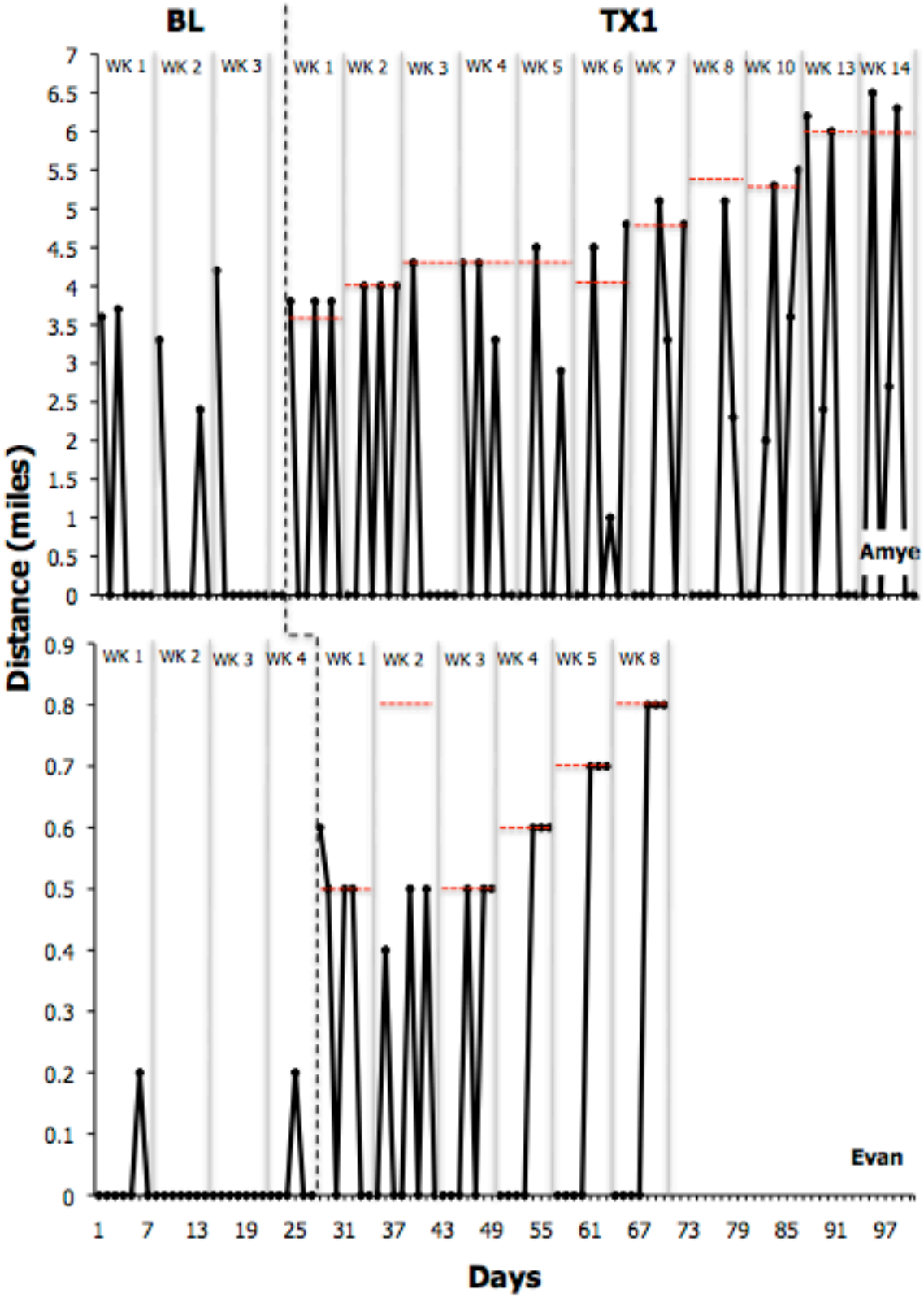

Figure 2. Baseline and Intervention results for Amye (top panel) and Evan (bottom panel).

Figure 3 illustrates the results from baseline and the first intervention for three participants. Kelsey (top panel) was in baseline for 14 days (two weeks), but since no running episodes were recorded, her baseline average per running episode was zero. A long-term goal of two miles was set at the first meeting following baseline. Once the modified treatment was enacted, Kelsey set a new long-term goal of three miles per week, and accomplished this goal in ten weeks (Figure 4). Jackie (middle panel) remained in baseline for 23 days (approximately three weeks). She ran two (3.5 and 2.7 miles) times the first week, once (3.1 miles) the second week, and on three occasions (3.3, 3.1, and 2.9 miles) over the remainder of baseline (10 days). Her baseline average per running episode was 3.1 miles. Jackie established a long-term goal of six miles at the initial meeting after baseline, but set a new long-term goal of seven miles per week once the modified intervention was introduced. Jackie met her goal in nine weeks (Figure 4). Mary (bottom panel) was in baseline for 27 days (about four weeks), and had no recorded runs during baseline. Her baseline average per running episode was zero. At the first meeting subsequent to baseline, Mary selected three miles to be her long-term goal, but set a new long-term goal of five miles per week once the alternative treatment was put in place. Mary met her long-term goal in 16 weeks (Figure 4).

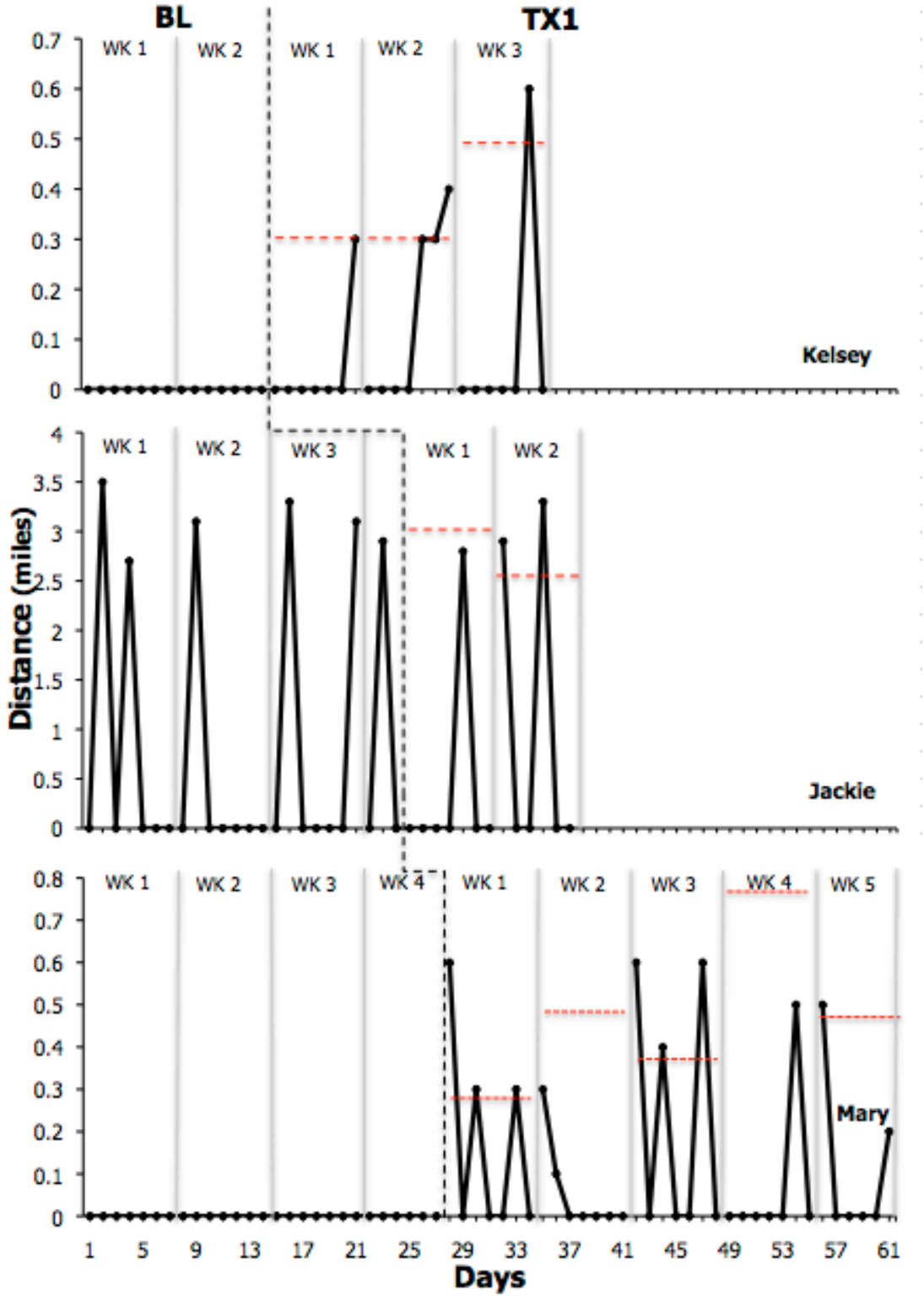

Figure 3. Baseline and Intervention results for Kelsey (top panel), Jackie (middle panel) and Mary (bottom panel).

Figure 4 demonstrates the overall weekly results from baseline, and first and second intervention for three participants. Jackie (top panel) failed to meet criterion for two weeks in the first treatment, but once the intervention was adjusted to reflect overall weekly runs she met, and exceeded, criterion on every week. Kelsey (middle panel) was in the first intervention for three weeks, but did not meet criterion on two of the three weeks. Once the intervention was modified she met criterion every week thereafter. Mary (bottom panel) was in the first treatment for five weeks, but did not meet criterion for two consecutive weeks. Once the modified intervention was established Mary was able to meet criterion in order to accomplish both her short and long-term goals.

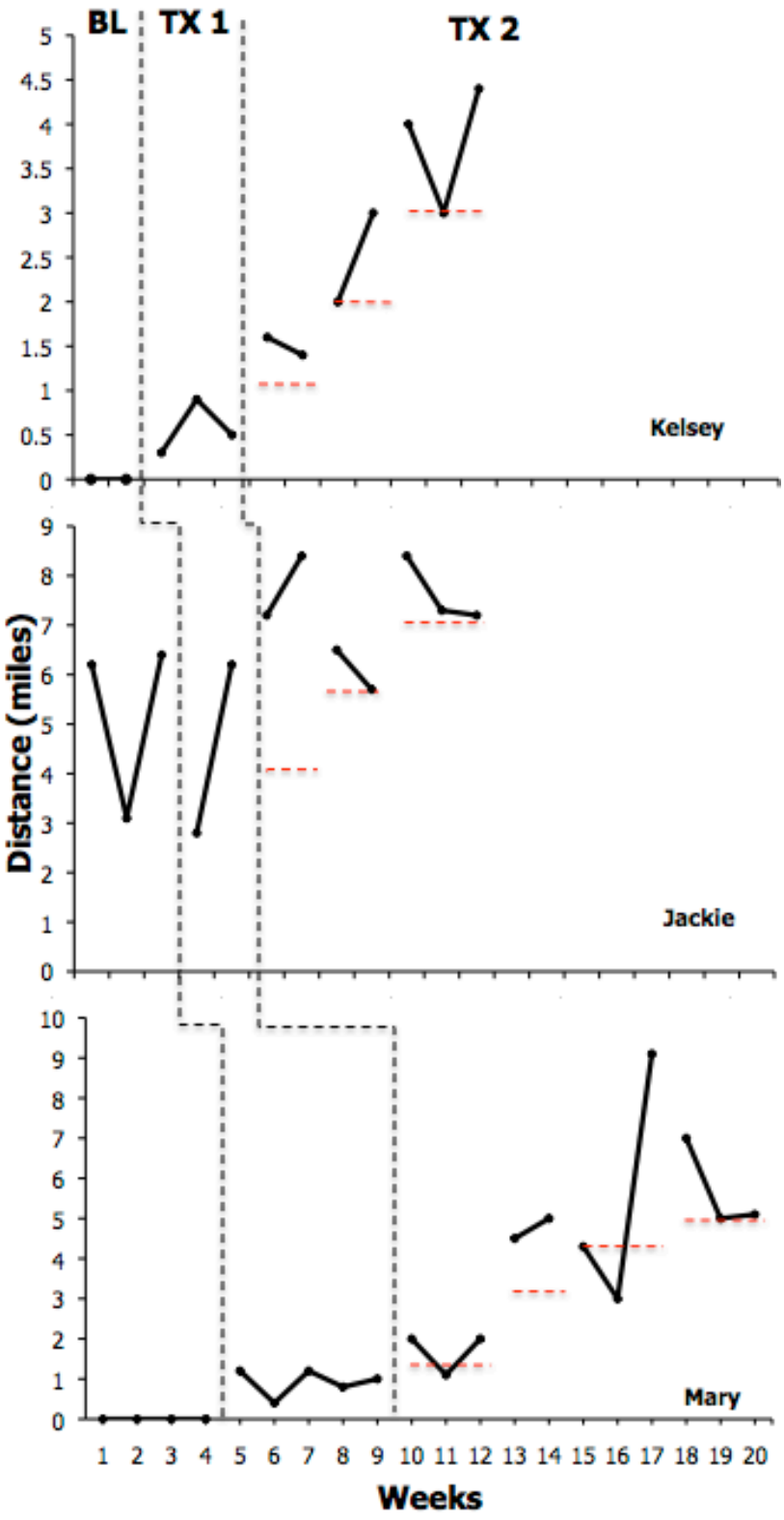

Figure 4. Intervention 1 and Intervention 2 results for Jackie (top panel), Kelsey (middle panel), and Mary (bottom panel).

According to the social validity questionnaire, all participants expressed that they enjoyed participating in the study, were happy with the results they achieved, thought the goal setting procedure was motivating, and planned to continue running even after the study ended. Four of the participants thought performance feedback along with goal setting were supportive, but the fifth participant stated that she was more motivated by herself than anything else. Lastly, four out of the five participants strongly agreed that the Nike™ + SportKit was a useful way to track running distance, but one participant disagreed. The participant who disagreed had several problems with her SportBand throughout the study, and it was hypothesized that these malfunctions may have made some impact on her opinion of the technology used in the study.

Table 2. *Results of the Social Validity Questionnaire*

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
I enjoyed participating in this study.	0	0	0	1	4
I am happy with the overall results I achieved as part of this study.	0	0	0	1	4
The goal-setting procedure helped to keep me motivated throughout the study.	0	0	0	2	3
The performance feedback I received was a helpful addition to the goal setting.	0	0	1	1	3
The Nike™+ SportKit was a beneficial way to keep track of my distance.	0	1	0	0	4
I plan to keep running after the study concludes.	0	0	0	1	4

DISCUSSION

The purpose of the present study was to address the existing limitations in the sports performance literature by extending goal setting research to include individual running performance and by assessing both short-term and long-term distance goals. Results demonstrated the utility of goal setting with performance feedback for enhancing running performance for individuals looking to increase distance. Results confirmed research findings that demonstrated success in setting both a short and long-term goal (Kyllo & Landers, 1995).

This study was not only the first to employ a single-subject design to evaluate an intervention for increasing running distance, but also the first to incorporate the use of the Nike™+ SportKit as an automated method of recording. The value of automated recording is so researchers do not have to rely on self-report from the participant. An advantage of the Nike™+ SportKit was that each participant could digitally see her progress on the watch while the goal was being targeted. One participant even stated that "there were times when [she] wanted to keep going to see that number continue to increase on the band, rather than just stopping after two or three laps." For two participants, Amye and Kelsey, the Nike™+ SportBand malfunctioned about halfway through the study. The digital display on the Nike™+ SportBand was the only recorded account of runs that were completed during each running episode. When they attempted to import their workouts onto the Nike™ website the data were not reported electronically. For the remainder of the study recorded runs had to be reported directly

from the Nike™+ SportBand rather than online from the nikerunning.com website. Future studies utilizing tracking equipment should ensure that equipment is functional and/or have back-up equipment readily prepared in case of potential malfunctioning.

Through data based decision-making, the decision to alter the intervention was made, and strengthened the study. This alteration could only be accomplished in a within-subject investigation with continuous data. Regardless of the modification of the intervention, four of the participants, with the exception of Evan, met their long-term goals within nine to sixteen weeks. Furthermore, all participants completed at least one run at a farther distance than their baseline average, and the overall weekly distance across all five participants increased throughout the study.

The initial intervention consisted of each participant running a minimum of three times during the week, and meeting, or exceeding, her previous short-term goal at least twice. While this intervention was successful for two participants, three participants had difficulty accomplishing this goal. The modified intervention was more flexible than the previous intervention, and overall weekly distance for all three participants increased after the modification. Prior to setting an overall weekly long-term goal, Mary and Kelsey both set long-term goals to achieve per running episode. Mary's goal was to run three miles (without stopping), and Kelsey's goal was to run two miles by the conclusion of the study. Both participants achieved their preliminary long-term goals. Once the modified intervention was introduced, Jackie also met, and exceeded, her short-term goal each week. Additionally, Jackie stated at the first meeting that she was interested in increasing her speed, which she also accomplished in the study. Prior to the study her personal record for three miles was approximately 30 min. After her recorded runs were reviewed, it was noted that on every occasion in which a 3-mile run was reported, her

duration was less than her previous personal record of 30 min. Her new personal record (as reported online) was 26 min and 28 s for a 3.2 mile run. The weekly overall distance goal was beneficial in accommodating those individuals who choose to run multiple times per day and those who could not commit to running a minimum of three times per week.

Electronic meetings (via Skype) occurred 25% of the time. Only three of the five participants had a goal setting and performance feedback meeting on Skype, and all three preferred this method of weekly interaction. One participant stated, "some of [her] meetings couldn't be held in person and were conducted via Skype instead. [She] found this to be just as effective and far more convenient than in-person meetings". Future studies should consider meeting this way rather than in person for the convenience of both those individuals involved.

In summary, the results from this study have demonstrated the effectiveness of a goal setting with performance feedback intervention used to improve running performance for individuals looking to increase distance. Since all participants' overall weekly distance increased throughout the study, an extension of the current research could incorporate the use of two long-term goals used to compare overall weekly distance and distance per running episode in order to determine if one is more effective than the other. Previous research has shown an increase in performance when goal-setting and public posting procedures are combined (Brobst & Ward, 2002). Goal-setting procedures set an explicit goal, and public posting procedures publicize performance and provide feedback to the performers. Future research could incorporate a public posting procedure via social media websites in order to assess whether the addition of that component has any effect on goal-setting and/or athletic performance.

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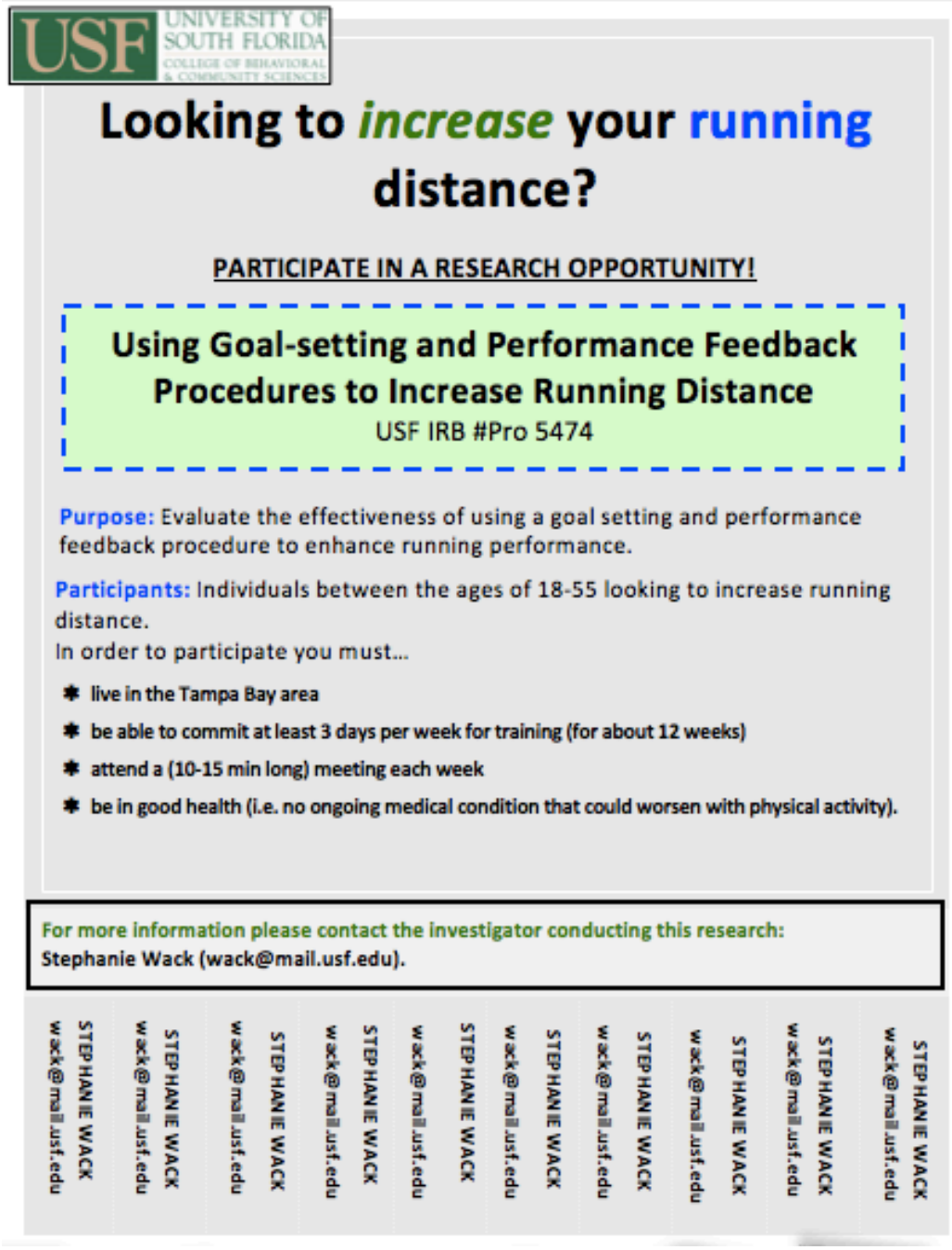
APPENDICES

Appendix A: Recruitment Flyer



Appendix B: Participant Information Questionnaire

Name: _____ Age:_____

Height: _____ Weight:_____

1. Biggest motivator to engage in exercise (check all that apply):

☐ Lose weight ☐ Improve appearance
☐ Increase muscle ☐ Build endurance
☐ Become healthier ☐ Other (please specify)_____

2. How many days a week do you currently run? _____ How far? _____

3. How many days a week are you able to run? _____

Please list what times you could run on each day listed below:

SUN	MON	TUES	WED	THUR	FRI	SAT

4. Could you commit 1 day per week (about 10-15 mins) to meet in order to go over the weeks progress and set a new goal? _____

5. How far can you run right now without stopping? _____

6. In approximately 12 weeks how far do you want to be able to run (without stopping)?_____

7. In the past week what is the farthest distance you ran without stopping_____ Approximately how long did that take you ?_____

8. Is there a specific time of the day that you run your "best"? _____

9. Do you currently own an iPod, iPhone, or Nike™ SportBand? _____

10. What do you prefer to run on:

☐ Track ☐ Trail ☐ Gravel ☐ Treadmill

Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed 3 to 5 times per week for 20-60 min per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

11. Do you exercise regularly according to that definition? (please check only one)
    - Yes, I have been for MORE than 6 months. ☐
    - Yes, I have been for LESS than 6 months. ☐
    - No, but I intend to in the next 30 days. ☐
    - No, but I intend to in the next 6 months. ☐
    - No, and I do NOT intend to in the next 6 months. ☐

Appendix C: The Physical Activity Readiness Questionnaire (PAR-Q)

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 they start becoming 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: answer YES or NO.

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you feel pain in your chest when you do physical activity?

3. In the past month, have you had chest pain when you were not doing physical activity?

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

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?

6.Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

7. Do you know of any other reason why you should not do physical act

Appendix D: Inter Observer Agreement Sheet

Participant: _____

Experimenter: Stephanie Wack

DATE (mm/dd/yy)	DISTANCE (miles)	AGREEMENT (circle one)
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No
		Yes / No

Opportunities of Agreement: _____
of Total Agreements: _____
Opportunity of Agreements / # of Total Agreements = _____

Appendix E: Social Validity Questionnaire

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 part of the study:

o Strongly Disagree o Disagree o No Opinion o Agree o Strongly Agree

Why:_____

3. The goal setting procedure helped to keep me motivated throughout the study:

o Strongly Disagree o Disagree o No Opinion o Agree o Strongly Agree

Why:_____

4. The performance feedback I received was a helpful addition to the goal setting:

o Strongly Disagree o Disagree o No Opinion o Agree o Strongly Agree

Why:_____

5. The Nike™+ SportKit was a beneficial way to keep track of my distance:

o Strongly Disagree o Disagree o No Opinion o Agree o Strongly Agree

Why:_____

6. I plan to keep running even after the study concludes:

o Strongly Disagree o Disagree o No Opinion o Agree o Strongly Agree

Why:_____

7. My overall opinion of the study:

o Great o Good o Okay o Bad o Very Bad

Why:_____

8. What did you like MOST about the study?

_____

_____

_____

9. What did you like LEAST about the study?

_____

_____

_____

10. Further Recommendations:

_____

_____

_____