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Effective Pedometer Programs: Determining the Motivational Factors Primarily Responsible for the Physical Activity Increases being made by Participants

Britne Engelking
Minnesota State University - Mankato

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By

Britne Engelking

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This thesis has been examined and approved by the following members of the thesis committee.

Dr. Marge Murray-Davis, Advisor

Dr. Autumn Hamilton

Dr. Sherry Folsom-Meek

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Statement of the Problem

Adults continue to get inadequate amounts of physical activity (Flegal et al., 2010; WCRF/AICR, 2009). Pedometer programs being implemented have effectively motivated the participants to increase their physical activity outputs; however, researchers have been unable to determine the features responsible for the physical activity increases.

Procedures

Participants were given pedometers to measure their physical activity outputs. The participants collected baseline data for one week. The experimental group was administered three competitive incentive interventions. Their data was compared to their baseline step data and step data collected from a control group. The data analysis was done using both the Microsoft Excel and SPSS programs, where dependent and independent t-test were used to determine if any significance existed.

Conclusions

The hypotheses were answered based on the following research questions:

1. Can the competitive incentive features of an online pedometer program have a significant effect on the participants regarding the amount of steps they take when cash and/or prize incentives are not offered?
2. Do the different types of competition (small groups of equal ability, intergroup, or large group of varying ability) vary in the effect they have on participants regarding the amount of steps they take?
3. Will the competitive incentive features of an online pedometer program have a significant effect on the participants (experimental) when they are compared to a control group and also to their own baseline data?

Among the 40 participants, t-test analyses found significant relationships between the physical activity outputs (steps) of the experimental group when compared to their own baseline data and to the control group's step data. Significant increases in steps counts were seen for all

three weeks of competitive incentive within the experimental group. No significant differences were found between the types of competition administered or between the groups when small ability groups were used as a competitive incentive.

Chapter One: Introduction

Getting regular physical activity can reduce the risk of acquiring many of the diseases prevalent in the United States adult population today (United States Department of Health and Human Services [USDHHS], 2008; World Cancer Research Fund and American Institute for Cancer Research [WCRF/AICR], 2009). The *Physical Activity Guidelines for Americans* report provides strong evidence to support that adults who are getting regular physical activity have a lower risk of developing coronary heart disease, high blood pressure, type-2 diabetes, colon cancer, breast cancer and metabolic syndrome (USDHHS, 2008). Further findings suggest that a decrease in stroke occurrence and/or likelihood of a premature death were evident in adults who received regular physical activity (USDHHS, 2008). Additional estimates show that global cancer rates could be reduced by one-third if individuals received regular physical activity and adopted healthier diet patterns (WCRF/AICR, 2009). Health advocates have been prompting Americans to engage in the recommended amount of physical activity in a variety of settings, so that in return, they may reap the associated health benefits.

Despite the benefits associated with physical activity, nearly 60 percent of adults living in the United States are still not getting the recommended daily physical activity **(**National Center for Health Statistics [NCHS], 2008; USDHHS, 2008**)** and as many as two-thirds are obese or overweight (Flegal, Carroll, Ogden & Curtin, 2010; WCRF/AICR, 2009). As a result, the United States Department of Health and Human Services (2008) reformatted their physical activity guidelines, giving adults more choices on how physical activity could be attained.

In 2008, the *Physical Activity Guidelines for Americans* were reexamined and it was determined that the recommended amount of physical activity needed to enhance an individual's health be changed from "moderate physical activity for a minimum of 30 minutes, 5 days each week or vigorous-intensity aerobic physical activity for a minimum of 20 minutes, 3 days each week" (USDHHS, 2008 p. 5) to "150 minutes a week in various ways" (USDHHS, 2008 p. 5). This change allowed adults to choose when and how they were getting physical activity and also made incorporating physical activity into their weekly routines less challenging. Despite the guideline changes, the percentage of adults not getting the recommended amount of physical activity continues to concern health care advocates across the United States **(**NCHS, 2008; USDHHS, 2008**)** and there has been no evident decrease in the amount of obese or overweight adults residing in the United States **(**Flegal, Carroll, Ogden & Curtin, 2010; NCHS, 2008; USDHHS, 2008; WCRF/AICR, 2009**)**.

With inactivity being a major contributing factor to the amount of Americans who are currently obese or overweight, the Surgeon General has made it a primary concern for all Americans to take action in fighting obesity (United States Department of Health and Human Services [USDHHS], 2010). In the *Surgeon General's Vision for a Healthy and Fit Nation,* The Surgeon General describes ways in which individuals can help fight the trend being seeing related to the amount of obese or overweight Americans that are currently populating the United States (USDHHS, 2010):

> Our nation stands at a crossroad. Today's epidemic of overweight and obesity threatens the historic progress we have made in increasing Americans quality of life…Every one of us has an important role to play in the prevention and control

> of obesity, Mothers, fathers, teachers, business executives, child care professionals, clinicians, politicians, and government and community leaders-we must all commit to changes that promote the health and wellness of our families and a community. (p. 1)

The Surgeon General continues to describe how individuals can improve the quality of their lives, and additionally prompts the American public to take action:

> I am calling on all Americans to join me in a national grassroots effort to reverse this trend…the real goal is not just a number on a scale, but optimal health for all Americans at every stage of life. To achieve this goal, we must all work together to share resources, educate our citizens and partner with business and government leaders to find creative solutions in our neighborhoods, towns, cities from coast to coast, together we can become a nation committed to become healthy and fit. (p. 1)

This report suggested that collaborative and individual efforts, made by all Americans, would be needed in order to reduce the population of obese or overweight adults residing in the United States. In response to this report, and others reflecting similar suggestions, healthcare advocates have made reducing this population a primary concern.

Healthcare advocates have used a variety of methods to encourage Americans to become more physically active. Current technological advances have allowed healthcare advocates the use of social media outlets through online systems or programs. The intent of implementing these programs has been to increase the amount of physical activity being exerted by the user. These users of these programs often times experience a series of interventions and generally allowed view their physical activity outputs along with the

physical activity outputs of the other users of the program. Online step-counting programs or "pedometer" programs have become popular among individuals and employers throughout the United States (Boyce, 2011). A pedometer is a device that can measure the amount of steps that the individual wearing it has taken. Pedometer programs have effectively motivated their users to increase the amount of physical activity they have achieved by: giving their user the ability to see their daily physical activity in the form of steps and calories burned, set goals, participate in challenges, and receive cash and/or prize incentives for a variety of achievements (Foster, Linehan, & Lawson, 2010; Kang, Simon, Barreira & Lee, 2009; VanWormer, Pronk, & Boucher, 2006). Despite researcher's suggestions regarding the effectiveness of online pedometer programs, many employers and healthcare advocates are unable to provide the cash and/or prize incentives that have been associated with the success of these programs (Boyce, 2011; United States Bureau of Labor Statistics [USBLS], 2012). Healthcare advocates continue to search for affordable and effective ways to motivate adults to increase the amount of physical activity they are getting in an attempt to reduce the amount of obese or overweight adults residing in the United States (USDHHS, 2010).

Need for the Study

The amount of obese or overweight adults not obtaining the health benefits associated with physical activity continues to be a problem for the United States. Many different types of pedometer programs have been implemented across the nation, providing researchers with evidence to suggest that these programs are effective when they are used to motivate physical activity increases in their users (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Although studies have shown that

pedometer programs are effective when increasing physical activity in small populations they may not be ideal for long-term implementation by the majority of employers due to the assumed cost associated with offering incentives (Boyce, 2011; USBLS, 2012). Additionally, researchers have had limitations regarding the results of their studies as they have been unable to determine if the cash and/or prize incentives or the competitive challenges features were primarily responsible for motivating their participants to increase their physical activity outputs (Foster et al., 2010; Kang et al., 2009). Effectively implementing pedometer programs without having to offer cash and/or prize incentives would allow more healthcare advocates and employers the ability to administer these programs to the general public. The ability to target a larger population to increase their physical activity outputs would cause the amount of obese or overweight adults residing in the United States to decrease.

Purpose of the Study

The purpose of the study was to determine the effect an online pedometer program would have on the participants when elements of competitive theory were used as motivation and no cash and/or prizes incentives were offered. Further, it examined the competitive theories of:

- Social comparison-individuals in a group, no matter what size the group is, will still be motivated to compare or compete (Festinger, 1954)
- The *N*-effect-individuals competing among smaller groups of equal ability will experience an increase in their motivation to compete (Garcia & Tor, 2009)

- Inter-group participation-individuals working together as an intergroup or "team" will have an increase in their motivation to compete when compared to others competing as individuals (Tauer & Harackiewicz, 2004).

Statement of Problem

Despite the benefits associated with physical activity, nearly 60 percent of adults living in the United States are still not getting the recommended daily physical activity **(**NCHS, 2008; USDHHS, 2008**)** and as many as two-thirds are obese or overweight (Flegal et al., 2010; WCRF/AICR, 2009). Many of the pedometer programs that have been implemented have effectively motivated the participants to increase their physical activity outputs; however, researchers have been unable to suggest which features were primarily responsible for the physical activity increases being seen in these participants.

Research Question's

The following questions regarding pedometer programs and the influence they have on individuals when attempting to increase the amount of physical activity they achieve were addressed:

(1) Can the competitive incentive features of an online pedometer program have a significant effect on the participants regarding the amount of steps they take when cash and/or prize incentives are not offered?

(2) Do the different types of competition (small groups of equal ability, intergroup, or large group of varying ability) vary in the effect they have on participants regarding the amount of steps they take?

(3) Will the competitive incentive features of an online pedometer program have a significant effect on the participants (experimental) when they are compared to a control group?

(4) Will the competitive incentive features of an online pedometer program have a significant effect on the participants (experimental) when comparing their competitive incentive step data to their own baseline step data?

Limitations

The Virgin HealthMiles program was used to measure the physical activity outputs of adults in the workplace. The study participants worked at the Braham school district in Braham, Minnesota. The majority of the limitations associated with this study were due to the climate, participant variables, and time of year the study was conducted. The limitations of the study included:

- Only employees that signed up for the school's wellness event and purchased a pedometer for $30.00 were able to participate in the study.
- The study had 40 participants.
- The participants ranged in age from 24-71.
- The participants were able to access their accounts from any computer connected to the internet after they uploaded the software. Some participants did not have internet access in their homes and were only able to access their accounts at the school.
- The participants were able to make social comparisons which may have increased the likelihood of cheating (i.e., shaking a pedometer by hand, attaching pedometer

to a pet etc.) in order to avoid any embarrassment of having lower step counts then others.

- The participants knew that their data was being collected and used for the study which may have motivated them to increase their physical activity outputs.
- Any participants involved in indoor volleyball leagues, aerobics classes, walking clubs etc. had dramatic increases in their physical activity.
- The participants going on vacations had dramatic increases in their physical activity. Increases may have been seen for those vacationing in areas where tourist attractions, amusement parks, and sightseeing opportunities were popular.
- The participants going on vacations had dramatic decreases in their physical activity. Decreases may have been seen for those vacationing in quiet locations where reading, lounging and relaxing were popular.
- Using new pedometer equipment along with being able to visually see progress relative to step counts could have caused participant's to have "higher than normal" baseline step count mean.
- The varying winter weather conditions and temperature may have limited the amount of physical activity the participants were able to get.
- The participants experiencing illness or injury may have had dramatic decreases in their physical activity.
- Some participants lost, wrecked, broke, or otherwise caused their pedometers to be inadequate or unusable for data collection.

Delimitations

The delimitations of the study were set by the researcher as a member of the school's Wellness Committee. Further delimitations were due to the researcher having a time limit in which the study had to be conducted in order to meet the institutional review board and graduation requirements. The delimitations of the study included:

- The study would be conducted in Braham Minnesota
- Only employees of the Braham school district were invited to participate in the school wellness event.
- The study was conducted over a period of one month from February 10th through March 10th.
- Quantitative data was obtained during the first week of the study and used as a baseline measure throughout the study.
- The Pretest-Posttest Control Group design was implemented.
- The Virgin HealthMiles pedometer program was used.
- Participants forgetting to wear their pedometers during the time of data collection were excluded from the study
- Participants who lost, wrecked, broke, or otherwise caused their pedometers to be inadequate and unusable for data collection were excluded from the study
- Participants who engaged in marathons or walk-a-thons were excluded from portions of the study.

Assumptions

Many of the participants in the study were teachers and therefore had received a four-year degree from a university. It was assumed that the participants were able to read and understand their responsibilities associated with the study. The researcher had previous experience with the Virgin HealthMiles pedometer program which led to the assumption that the participants would be able to operate their pedometer and the program with much ease. When examining the participants involved in the study, the researcher made the following assumptions:

- Participants had attended a training session put on by the researcher and were therefore able to use their pedometers and sync them to their computers without experience any difficulties.
- Participants had made an effort to wear their pedometers every day.
- Participants engaged in "normal" amounts of physical activity for their baseline week measures.
- Participants did not cheat as they had signed a document stating that the step count they provided was honest and that they were the only individual who wore the pedometer throughout the time period of the study.
- Participants wanted to become more physically active.
- The majority of the participants had access to their accounts from two locations, their school computers and their home computers, due to the growth of the internet and use of computers by the general public.

Definition of Terms

- **Physical Activity-**Any activity in which a body is in motion rather than at rest
- **Social Comparison Theory-**Humans possess a drive for self-evaluation and furthermore, individuals could learn about their abilities and attitudes by comparing themselves with others. People mostly seek to compare themselves with someone having reasonable similarities to them, however, if no individuals are present that have reasonable similarities; comparisons will usually be made to anyone present at the time of comparison (Festinger, 1954).
- **Social Interdependence Theory-**The concept behind this theory that in order for it social interdependence to exist, individuals need to share common goals and each individual's outcomes are affected by the actions of others (Stanne, Johnson, D. W., & Johnson, 1999, p.134).
- **Inter-Group Competition-**A contest between two or more groups (Tauer & Harackiewicz, 2004).
- **Cooperation-**Working together to accomplish shared goals. Individual performance is checked regularly to ensure that all participants are contributing regularly" (Johnson, D. W., & Johnson, 1999, p. 86).
- **Pedometer**- An instrument recording distances a person covers on foot by monitoring their steps (Tudor-Locke, & Bassett, 2004)
- **Competition-**To desire to attain a goal against other individuals, such as an advantage or a victory (Malhorta, 2010)
- **Motivation-**The driving force by which humans achieve their goals (Malhorta, 2010)

- **Equal Ability Groups**-Individuals having similar achievement levels of baseline data are placed into specific groups when conducting similar tasks (Tudor-Locke & Bassett, 2004)
- **Incentives-**Rewards items viewed as desirable given to individuals upon task completion (Malhorta, 2009)
- **Step Counting Programs-**Various programs administered by employers that use pedometers or accelerometers with the goal of increasing physical activity (Boyce, 2011).

Summary

Although getting the recommended amount of physical activity can reduce the risk of acquiring many of the health conditions prevalent in the United States, there is not sufficient evidence to suggest that the majority of adults in America are getting this amount (Flegal et al., 2010; WCRF/AICR, 2009). The Surgeon General has made it evident that encouraging increases in physical activity is at the top of her priorities for all Americans (USDHHS, 2010). Healthcare advocates and employers continue to implement programs, with online pedometer programs being among the most popular, in an attempt to decrease the amount of obese or overweight adults residing in the United States (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Researchers have suggested that pedometer programs can be used to effectively motivate individuals to increase the amount of physical activity they achieve, however, the specific variable responsible for triggering this motivation remains unknown (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Furthermore, the majority of pedometer programs that have been researched, have offered cash and/or prize rewards to their participants,

which presents a challenge to those wanting to target a large population (Boyce, 2011; USBLS, 2012). Pedometer programs have the capacity to motivate their participants in a variety of ways; however, there is insufficient research to suggest that these programs are effective when cash and/or prize incentives are not offered.

Chapter 2: Review of Related Literature

Introduction

The amount of overweight and obese adults continues to be a problem in the United States despite the many health benefits associated with living a physically active lifestyle **(**Flegal, Carroll, Ogden & Curtin, 2010; NCHS, 2008; USDHHS, 2008; WCRF/AICR, 2009**)**. For the purpose of the study, the areas of literature reviewed that pertained to adult inactivity were primarily used to present the problem the United States is facing regarding the number of adults who are currently not getting adequate physical activity. The scope of research included the studies done in following areas: effective pedometer programs, competitive theory, motivational theory, the conversion of pedometer steps into physical activity equivalencies, and effective grouping for increased motivation. The compilation of research was condensed into five following categories. The categories included: (a) an effective pedometer program using social comparisons without incentives, (b) effective pedometer programs using social comparisons with incentives, (c) competitive and social comparative theories and the effect they have on motivation during individual competition among small groups of equal ability, individual competition among a large group of varying ability and intergroup or "team" competition, (d) converting pedometer steps into physical activity levels for appropriate grouping and (e) summary of reviewed literature.

An Effective Pedometer Program using Social Comparisons without Incentives

Over the last decade, many researchers have conducted studies on the effectiveness of online pedometer programs (Kang et al., 2009). In an attempt to reduce the amount of Americans suffering from foreseeably preventable illnesses, pedometer

programs have been designed so that companies can administer them in the workplace to motivate their employees to increase the amount of physical activity they are getting. One study conducted at the Lincoln Social Computing Research Centre (Foster et al., 2010) found that when using simple mobile devices (i.e., pedometers/accelerometers) and an online social network (Facebook), adults could successfully be motivated to increase their daily physical activity outputs. This study had two groups of participants, one group was socially-enabled, the other non-social. In the socially-enabled condition, participants were allowed to view each other's step data and post comments pertaining to both their daily step counts and the step counts of other participants in the group. In the non-social condition, participants could only view their own personal step data. This study suggested that 9/10 participants walked more steps or got more physical activity, when they were in the socially-enabled group. Participant's responses were documented and the comments showed that the competitive aspect of being able to view others step count totals was a main component responsible for motivating the individuals to increase their physical activity outputs.

Foster, Linehan and Lawson (2010) suggested that the use of step counting devices and social comparisons could function as successful triggers for positive changes in behavior. According to Foster and colleagues (2010, p.1) the conclusions drawn from this study were that "the social and competitive interactions occasioned by the social version of the Step Matron Facebook application motivated participants to become more physically active during work". Furthermore, Foster and colleagues suggested that the individual's ability to make the social comparisons was responsible for the physical

activity increases being seen as they were able to thoroughly examine behavioral factors along with the step the count data of the other participants.

The participants in the study viewed their step counts while working; however Foster and colleagues (2010) suggested that steps taken may have been viewed more dynamically by participants rather than just merely viewing steps as data:

> It is possible that these (data related to steps) were considered not purely as the number of steps taken, but as steps closer to beating their friend, steps closer to winning, or as a performance that needed to change in order to achieve equality with fellow participants. Without the competitive Facebook application, this would not have been possible. (p.1)

Foster and colleagues never initiated an official competition or offered incentives for winning any type of competition. They added a feature to their website asking the question "who got the most steps today" and the participants began engaging in their own competitions. Foster and colleagues suggested that additional research should be conducted on these types of socially comparative, online step counting programs in order to determine their effectiveness. Although Foster and colleagues did not offer any cash and/or prize incentives to the participants in their study, physical activity increases were still prevalent among the participants in their socially-enabled group. Their research suggested that the use of cash and/or prize incentives may not be necessary for these types of programs to be effective.

Effective Pedometer Programs using Social Comparisons with Incentives

Pedometer programs similar to the one researched by Foster and colleagues (2010) and also more advanced or developed pedometer programs that offer challenge

features and cash and/or prize incentives, have been analyzed regarding their effectiveness (Kang et al., 2009). One study conducted by the Diabetes Spectrum showed an increase of mean daily steps by 21% when incentives were used to motivate activity (VanWormer et al., 2006). Researchers concluded that these programs may have been effective solely based on the incentives being offered. Using incentives to motivate individuals has been done in a variety of settings. Further research was done to determine what effect offering cash and/or prize incentives had on an individual.

The risk of undesired behaviors when offering incentives. In a study conducted by Malhorta (2010); the elements affecting an individuals' desire to compete were thoroughly analyzed. Upon reviewing this research it was determined that an association exists between increased risk factors to an individual when they are offered cash and/or prize incentives for completing tasks. Malhorta suggested that when individuals are offered a reward they deem valuable it then transfers any natural motivation they had into a pursuit of "winning" or the "desire to win", furthermore, when this happens the preference is solely for the relative payoff which triggers the "win at any cost mentality" causing them to neglect their own wellbeing and potentially cause harm to themselves or others. Upon reviewing this research, it was determined that motivation through cash and/or prize incentive programs may cause unfavorable behaviors among participants. Further research on the pedometer programs that had offered cash and/or prize incentives to motivate their participants was done in order to determine if these programs were effective.

The effectiveness of pedometer programs: A meta-analysis. In their meta-analysis on the effects of pedometer-based physical activity interventions, Kang and

colleagues (2009) examined pedometer programs designed to increase the amount of daily physical activity that the participants were achieving. After reviewing 103 articles relating to effective intervention methods and eliminating duplicate studies, they found 32 studies conducted in this area to determine what affect the intervention features associated with pedometer programs had on individuals' motivation to increase their physical activity. In order to be included in the reviewed pedometer-based programs, the studies reviewed had to meet the following criteria: At least one participant group used pedometers daily, pedometers were used as a motivational tool during the intervention, step counts were assessed pre and post intervention/incentive and the intervention periods lasted at least 4 weeks. The evidence accumulated by Kang and colleagues suggested that the use of pedometers programs had a moderate and positive effect on the increase of physical activity in the intervention studies.

Once Kang and colleagues (2009) had condensed their studies, they were categorized into one of three areas of focus for their meta-analysis: (a) programs using goal interventions of increasing daily step counts by 2,000 with cash and/or prize incentive offerings (b) programs using goal interventions for individuals to get 10,000 steps in a day with cash and/or prize incentive offerings, and (c) programs categorized under the title "other". No categories were made based on examining the effect the social comparison or competitive challenges had on the participants when no incentives were offered. Although the evidence of their reviewed studies suggested that pedometer program interventions had an increasing effect on the physical activity of the participants, Kang and colleagues were unable to determine whether the goal setting, competitive challenge features or the offerings of incentives were primarily responsible for

motivating the physical activity increase responses in participants. Similar to Foster and colleagues (2010) Kang and colleagues suggested that further research be conducted on pedometer programs in order to determine which motivational attributes were effective.

Competitive Theory and Social Comparison: Effect on Motivation

Motivation can be described as the driving force by which humans achieve their goals or accomplish tasks (Malhorta, 2010). In the *Desire to Win*, Malhorta (2010) makes reference to the book *The Evolution of Cooperation* by Axelrod, 1984 in which she discovered that the motivation to compete often promoted survival and success. In addition to this discovery Malhorta was able to determine that competitive behaviors may also be primarily responsible for creating value. The majority of the literature reviewed on competition suggested that competition had a direct effect on an individual's motivation and that when a competition was administered in the optimal environment, it showed that motivation increased. Results suggested that competition had the potential to increase motivation in a variety of settings and that offering cash and/or prize incentives may not be necessary to motivate individuals. In order to effectively administer a competitive challenge using a pedometer program, various dynamics of competitive and motivational research were the next areas of literature reviewed in order to determine best practices as relative to motivation.

The *N*-effect: Study details and results. In Garcia and Tor's (2009) study on the *N*-effect and the theory of using competitive motivation in its optimal environment, certain elements were shown to significantly increase an individual's competitive motivation. Garcia and Tor modeled their research design around Festinger's theory on social comparison. Festinger's theory was that humans possessed a drive for self-

evaluation. He stated that one could learn about their abilities and attitudes by comparing themselves with others and that people, in general, mostly seek to compare themselves with someone having reasonable similarities (Festinger, 1954). In addition to this, Festinger stated that if there were no individuals present having reasonable similarities; comparisons would still be made to anyone present at the time of comparison. Garcia and Tor (2009) hypothesized that individuals would not be inclined to compare themselves when the group size was large, opposing what Festinger had suggested about social comparisons. Upon reviewing Garcia and Tor's study and the findings of Festinger's theory of social comparison, substantial evidence suggested that comparing oneself socially or engaging in competition had varying effects on the motivational levels of those engaged, and furthermore, these motivational levels were determined by the type of competition being conducted.

Although Garcia and Tor (2009) agreed with Festinger (1954) on his findings as they related to social comparisons being made to those have reasonable similarities, they hypothesized that the opposite would happen as group size increased. Specific findings of Garcia and Tor showed that an increase motivational effect occurred when individuals were placed in smaller groups of equal ability and a decreased motivational effect occurred when individuals were placed into large groups of equal ability. They termed this concept the *N*-effect.

Study details: The N-effect. The participants in Garcia and Tor's (2009) studies were given surveys that included a series of rhetorical questions related to group size effect when examining: effort exerted or motivation, competitive feelings, social comparisons, and the effect of social comparison on competitive motivation. Of the

various surveys done, all had similar results. In one survey conducted, individuals were asked about the amount of effort they would exert when running a 5-K race against either 50 or 500 participants. Results suggested that when given the choice, individuals participating in the smaller group (50) would exert more effort than in the larger group (500) (Garcia & Tor, 2009). In another survey, questions were asked related to the nature of competitive feelings participants would have towards other interviewees depending on the amount of interviewees they would be competing against for the same desired position. Garcia and Tor determined that competitive feelings decreased as the number of interviewees increased. In Garcia and Tor's final survey, participants were asked questions about using Facebook to accumulate the most amounts of friends and told that the winner would be given a prize. Additionally, they were told that the competition pool would be either 10 or 10,000 and those finishing at top would get the prize. They were asked to what extent they would be motivated to compete to win the prize, to what extent they would be inclined to compare their own progress to competitor's progress in both situations, and finally to what extent they felt it would be easy to win the cash prize. The conclusions based on the results of the survey were that individuals: (a) were more motivated to compete against 10-competitors rather than 10,000-competitors, (b) were more inclined to compare their own progress against 10-competiors rather than 10,000-competitors condition, and (c) that individuals felt more likely to win in the 10-compeitiors condition than in the 10,000-competitors condition (Garcia & Tor, 2009).

Analyzing the results: The N-effect. Garcia and Tor (2009) believed that their findings on the *N*-effect opposed Festinger's findings on large group comparisons being made; however, Garcia and Tor did not test the large group comparison theory as they did

not offer any hypothetical situations in which the option for social comparison (competition) was either a large group setting or not being able to socially compare (compete) at all. Instead they provided questions that allowed respondents to estimate their efforts based on the group size. Further limitations regarding the *N*-effect were that Garcia and Tor (2009) used hypothetical questions in the form of surveys and did not examine the actual effect social comparisons or competitive motivation could have on increasing motivation related to task completion or motivational effort exerted during actual activity.

Although Garcia and Tor's study had limitations, their findings related to the *N*-effect (Garcia & Tor, 2009) along with Festinger's (1954) theory on social comparison provided valuable results, suggesting that competition and social comparative factors did have an effect on an individual's motivation in a variety settings. The studies done on the *N*-effect and social comparison theory suggested that the initiation of a competitive event in a variety of head to head or individual settings would result with the participant experiencing and increase in their motivational levels. After determining there was an increased motivational effect triggered by head to head competition, the next area of research examined the effect of "team" or intergroup theory and the effect it had on an individual's motivation level, enjoyment and desired outcomes.

Intergroup competition: Meta-analyses. In a study conducted by Allen and Hecht (2004) they analyzed the conflicting views associated with team effectiveness and the enthusiasm for teams. In their meta-analysis they analyzed the effects of team-based (intergroup) work suggesting that many studies provided evidence supporting either positive or negative aspects associated with the dynamics of intergroup work. Allen and

Hecht suggested that intergroup work provided competence-enhancing opportunities along with social-emotional and competence-related benefits. Further findings of their research suggested that belonging to and participating in groups, could enhance core feelings of efficacy and confidence. Allen and Hecht's research had limitations as the participants involved in their research were primarily those employed in the business setting and the interventions were based solely on the completion of projects and/or presentations applicable to their field. Researchers in other fields have conducted meta-analyses similar to Allen and Hecht's to determine the effect intergroup participation would have on the desired outcomes.

Tauer and Harackiewicz (2004), much like Allen and Hecht (2004), suggested that in order to create optimal motivation, both cooperative and competitive theory should be applied. Other researchers coming to similar conclusions included Stanne, Johnson D. W, and Johnson (1999) in the meta-analysis they conducted, comparing the effects of cooperative, competition, and/or individual goal structures on motor-performance tasks. In the 64 studies they examined they came to the determination that cooperation led to higher levels of performance than the individual competitive conditions did. This indicated that cooperation had potential positive outcomes. This was the basis for Tauer and Harackiewicz's further examination into the two dynamics of cooperation and competition the effect they had when used in combination.

Study Details: Intergroup competition. Tauer and Harackiewicz (2004) conducted four studies and did a meta-analysis of their studies to determine the effectiveness of intergroup competition, pure competition and pure cooperation on task enjoyment and performance. In the first study conducted by Tauer and Harackiewicz

they focused on task performance by having 36 boys participate in shooting 20 free-throws involving various conditional settings. The boys were placed into one of three groups and given one of the following conditions: Condition one-pure cooperation in which two boys were paired together and instructed to make a certain number of baskets together, condition 2-pure competition in which each boy was given the goal to score more free-throws than their opponent or condition 3-intergroup competition in which two boys formed a team and were given the goal of scoring more baskets than another two-person team. The results of their findings were that participants in the intergroup competition made significantly more free throws and had higher levels of task enjoyment then the participants in the pure competition or pure cooperation group (Tauer & Harackiewicz, p. 852). Tauer and Harackiewicz decided to conduct a similar study with an increased sample size and age range, in addition to making modifications to their groups and study design.

The second study conducted by Tauer and Harackiewicz (2004) was conducted under the same basic design used in their first study except they increased their sample size to 111 boys and conducted their study for two days. The first day of their study was used to collect baseline data while the second day was for initiating the intervention and collecting data. On the first day of the study the boys were instructed to shoot 10 free throws, this data was then used as a baseline measure for each participant. On the second day of the study, the boys were randomly placed into one of four conditions: pure cooperation, pure competition or intergroup competition and a fourth condition, individual goal. The conditions of the first three groups would be the same as study one; only rather than shooting 20 free-throws, 10 were shot. In the fourth condition of

individual goal setting, data was taken from the participant's scores of baskets made the previous day as a basis for a performance goal. Upon concluding the sessions, each participant received feedback related to if they were meeting either their individual or team goal.

After analyzing the data they collected, they found that once again that the participants in the intergroup competition condition made significantly more free throws than the participants in the other three conditions. Participants were also given a short questionnaire regarding the motivational attributes that affected their efforts upon completing their tasks. The conclusion of their findings in all of the variables analyzed by Tauer and Harackiewicz (2004) was that enjoyment increased along with performance among the participants of the intergroup competition when compared with the pure cooperation and pure competition groups. Tauer and Harackiewicz continued to be intrigued by their results and conducted two additions studies having similar construct to the first two changing a few items to optimize their findings.

Analyzing the results: A meta-analysis on intergroup competition. Upon the completion of all four of their studies, Tauer and Harackiewicz (2004) conducted a meta-analysis and provided evidence that supported their primary hypothesis in which they suggested that participating in the intergroup competitions would lead to higher levels of task enjoyment and performance then participating in the pure cooperation and competition groups (Tauer & Harackiewicz, 2004). Upon reviewing their accumulated data taken from their meta-analysis conducted, Tauer and Harackiewicz made the following correlation, "the positive effect of intergroup competition on task enjoyment and performance was highly significant" (Tauer & Harackiewicz, 2004 p. 859). Tauer

and Harackiewicz provided substantial evidence that intergroup competition produced favorable results. Furthermore, the research suggested that using intergroup competition triggered cooperation within the group and also increased the motivational level of the individuals in the group. Determining the most effective way to increase motivation for intergroup or team competitions was examined in further detail to determine best practices.

The effect of interdependence on individual motivation. Stanne, Johnson, and Johnson (1999) conducted research on the effect inter-group competition and cooperation had on an individual's motivation to compete. Social interdependence exists when individuals share common goals and each individual's outcomes are affected by the actions of others (Stanne et al., 1999 p.134). According to Stanne and colleagues (1999), within cooperative situations, individuals seek outcomes that are beneficial to themselves and beneficial to all other group members. Additional research done in the area of individual and team motivation focused on the effect cooperation had on competition.

In the article reviewed by Bar-Yam (2003) related to complex sport systems and the effectiveness of teams, Bar-Yam discusses Darwin's ideas and the study of evolution, primarily focusing on competition being the driving force of evolutionary change. Bar-Yam (2003) suggested that when individuals on a team cooperated they would also compete better as a team. Furthermore, when a team competes, it motivates the individual's desire to cooperate with other team members. The findings of Bar-Yam (2003) related to team dynamics affecting competitive motivation state the following: "When teams compete, this motivates the cooperation between players. We see that there is a positive or constructive relationship between cooperation and competition when they

operate at different levels of organization: team competition and individual cooperation" (p. 6). According to Bar-Yam (2003) teams perform well because it is understood that effectiveness of a team is generally not related to the single possible action of one individual but from a set of collective actions exhibited by all individual team members. It is this concept that suggests the cooperative or collaborative efforts of a team along with initiating the motivation to compete may possibly have a greater effect on the desired outcome(s) (Bar-Yam, 2003).

Through the collective review of research on competition and motivation it was suggested that competition, in a variety of settings, had an increase effect on motivation. Effectively administering a pedometer program requires that the facilitator have the ability to place participants into optimal group settings for the interventions. Effectively administering various competitive challenges within pedometer program would require that the facilitator had the ability to appropriately group participants based on their ability or activity level. The ability to convert the pedometer steps an individual has taken into physical activity equivalencies would be the next area researched

Converting Pedometer Steps into Physical Activity Levels

In order to accurately measure physical activity outputs, many populations have adopted the use of pedometers to count the amount of steps taken daily by their users. With the current technology available, pedometers have now made advances giving one the ability to measure additional dynamics of physical activity (Boyce, 2011). These new wave pedometers are termed accelerometers. According to Tudor-Locke, Johnson, and Katzmarzyk (2011), "Accelerometers are robust in their data offerings; raw outputs of minute-by-minute steps and activity counts can be manipulated to derive physical activity

volume and be used to determine intensities of activity" (p. 410). In a study conducted by Tudor-Locke and his colleagues (2011) they discuss how the National Health and Nutrition Examination Survey (NHANES) had started using pedometers to acquire free-living physical activity behaviors, which made them the largest and only nationally representative survey in the United States to have adopted a way to measure objective physical activity. It was the goal of Tudor-Locke & Basset (2004) to translate steps taken when using a pedometer into physical activity cut points for healthy adults.

Having the ability to place adults into groups of equal ability allows for an optimal environment in which higher levels of motivation to compete could be exhibited. Placing individuals into groups of equal ability or physical activity levels was determined to be most effective when triggering motivation to compete (Garcia & Tor, 2009). Translating the steps an individual has taken into a physical activity or "ability" groupings has been researched by Tudor-Locke and Bassett (2004). In the study conducted by Tudor-Locke and Bassett (2004) they concluded that daily steps taken could be translated into the following activity levels: (a) sedentary=Less than 5,000 steps per day (b) low activity=5,000-7,499 steps per day (c) somewhat active=7,500-9,999 steps per day (d) active=10,000-12,499 steps per day and (e) highly active=greater than 12,500 steps per day (p. 1). This study provided one the ability to convert the pedometer steps taken by an individual and place them into a specific level or category of activity/ability. Implementation of a competitive challenge in which participants were competing among or within a smaller group of equal ability could be conducted based on the findings of Tudor-Locke and Basset (2004)

Summary

There is substantial evidence that adults living in the United States are not getting the recommended amount of physical activity needed to achieve the associated health benefits **(**NCHS, 2008; USDHHS, 2008; WCRF/AICR, 2009). In order to effectively motivate adults to increase the amount of physical activity they are getting, various pedometer programs, theories related to motivational contributors (including social comparison and competitive theory), and methods for grouping to create optimal environments were examined in detail. Pedometer program researchers have been unable to determine if the competitive challenge features or the incentives offered motivated participants (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Further findings suggested that incentives may not be necessary to trigger motivation (Foster et al., 2010). The compilation of research suggested that both individual and team competition had a positive effect on an individual's motivation, however, research has not been done on the effect they have on an individual's motivation when implemented in pedometer programs that do not offer cash and/or prize incentives.

The conclusions made upon reviewing the related research led to the following null hypotheses:

(1) Null Hypothesis: There will be no significant difference in the amount of total steps taken by individuals that participated in pedometer program when competitive incentives were used verses the amount of total steps taken by the participants when no competitive incentives were used.

(2) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in small groups of equal ability

as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(3) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in intergroup competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(4) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in a large group competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(5) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses intergroup competition as competitive incentive.

(6) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses large group competition as competitive incentive.

(7) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in large group competition as competitive incentive verses intergroup competition as competitive incentive.

(8) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when small groups of equal ability were used as competitive incentive and cash and/or prize incentives were not offered.

(9) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when intergroups were used as competitive incentive and cash and/or prize incentives were not offered.

(10)Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by the participants verses the amount of steps taken when one large group competition was used as competitive incentive and cash and/or prize incentives were not offered.

Chapter Three: Methods

Introduction

In this chapter, various dynamics of the study conducted, will be introduced and explained in detail including: research design, participant selection, instrumentation, data collection, interventions and data analysis. Any conclusions drawn from the data collected will be discussed in the following chapters.

Research Design

The Pretest-Posttest Control Group Design was followed for the study conducted. In order to effectively analyze the data gathered for the purposes of the study, participants were given a pretest or a baseline test to determine their average amount of weekly steps. After baseline data had been collected for the participants, the experimental group received three competitive incentive invitations (one each week) or "challenges". The step counts taken from the participants in the experimental group were compared to their own baseline step count data and to the data collected from the control group. The participants were given the following guidelines upon attending a training session by the researcher: (a) attend a training session or confirm reviewing the training session supplemental piece with the researcher and sign the consent form (b) set up their online accounts in order to track their steps after they received their pedometers (c) conduct their daily lives as "normal" as possible while wearing their pedometers throughout the first baseline week of the study (d) plug their pedometers into their computers daily, connecting them to their Virgin Health Miles accounts, and (e) accept any challenge invitation they received from the research. Participants were given their pedometers and they tracked their steps for exactly one week from the time they activated or synced their

pedometers with their corresponding online account. Once their data had been collected and analyzed participants were placed into either the control group of the experimental group.

Group placement: Experimental or control. After the training sessions were completed by all participants and consent forms were signed, participants were given their pedometers and the study began with acquiring "baseline" step count data. The mean of the seven day total number of steps each participant had taken was then used as baseline data. Participant's baseline step count means were used to generate a list ordering participants from lowest amount of daily mean steps to highest amount of daily mean steps. After the list was made the researcher then placed participants into one of two groups, alternating group assignment from the ordered list of daily mean average steps, in order to ensure that an equal amount of activity levels were represented in both the control and experimental group. After participants were placed into one of two groups, a coin was flipped to determine which list of participants would be the control group and which would be the experimental group. The two groups would receive the following intervention or non-intervention:

- Control group: This group experienced no social enablement and no interventions or competitive challenges. They had access to their online accounts and were able to see their own step data.
- Experimental group: This group experienced social enablement and received the following challenge interventions: (a) individual competition in small groups of equal ability (b) intergroup or team competition (c) competition among one large

group of varying ability. They had access to their online accounts and were able to see their own step data and the step data of the others in their group.

Participant Selection

Participants were selected from the employed adult population. The sample was taken from adults employed by the Braham Area School District. Of the 100 employees on staff receiving the email invitation to participate in the study, it was anticipated that the number of participants would be 25. The actual sample size was 42 adults, ranging in age from 24-71. Two participants had data excluded from the study due to the participant's non-compliance with the study guidelines. The final sample size used for data analysis included 40 participants. Participants included: teachers, administrators, secretaries, paraprofessionals and additional support staff (i.e. community education, human resources, cooks, bus drivers and custodians). The majority of the participants wore their pedometers every day. Some participants had variations in step data due to external factors such as: vacations, one-time events (walkathons, 5K runs etc.), acquired illnesses, discouraging weather conditions for outdoor activity, broken or lost pedometers, forgetting to wear their pedometers, or otherwise indicated that they had experienced a problem with the program. Using new pedometer equipment along with being able to visually see progress relative to step counts could have also caused participant's to have "higher than normal" baseline step count mean.

Instrumentation

The researcher used the Virgin HealthMiles Online Pedometer Program to collect participant data. The participant's membership fees for the Virgin HealthMiles one-year online program were paid for by Resource Management and Training Solutions and the

Braham School Wellness Committee. Participants were required to pay for a portion of their pedometer ($30) and were allowed to keep their pedometers upon the conclusion of the study. Participants in both groups were required to log into their accounts daily by plugging their pedometers into their computer. Daily step counts were displayed on the online program and the researcher had access to each participant's online accounts in order to obtain their step count data. The emphasis of the pedometer program was for the participants to increase moderate physical activity and/or daily steps. Participants were instructed not to begin any new vigorous exercise routine or try to dramatically increase their step counts without consulting their physician first and were reminded to always stretch before and after engaging in any type of physical activity. Participant safety was focused on largely during the before and after school training sessions.

Participant responsibility to accurately measure steps. Every participant in the study was able to view their personal daily step count totals dating back to the first day the study began. For the first week of the study, participants were instructed to conduct their daily activities as normally as possible to get accurate measurements of their physical activity levels. The mean of the participants' weekly step count data, collected from each participant during the first week of the study, was used as their baseline amount and compared to their mean weekly step count data during the intervention or non-intervention weeks in order to determine if the program had a significant effect on the participants. The participant's baseline step count means were also used to assign participants equally to both the control and experimental groups. For the experimental group, the following sub-groups were made for the first two interventions: Group a-sedentary activity (0-4,999 steps per day) group b-low activity

(5000-7,499 steps per day), group c-somewhat active (7,500-9,999 steps per day) and group d-active to highly active (10,000 or greater steps a day).

Data Collection

Pedometers designed by the Virgin Corporation HealthMiles division, and were used to collect data related to the step counts the participants wearing them would get daily. The researcher attended a seminar in which the Virgin HealthMiles pedometer program was explained in detail, and individuals were trained on how to use many of the components the program offered. The pedometers being used were reliable and able to closely record the general amount of steps the individuals were taking while also storing several weeks' worth of data (Boyce, 2011). The researcher held four training sessions (two before school and two after) that participants were required to attend in which they received instructions on how to use their pedometers and the online program. In these training sessions the researcher taught the participants how to: Register for and upload the HealthMiles program, use and sync their pedometers, accept challenges, view challenge standings, log their steps and set goals. After attending a training session individuals were required to sign the consent form and provide the researcher with their user name and password before any data could be collected or analyzed.

Interventions Administered

Although both groups of participants wore their pedometers and logged their steps daily, participants in the control group did not receive any competitive incentive interventions whereas participants in the experimental group received three different competitive incentive interventions. Each week, after the baseline data collection week, the participants in the experimental group experienced a different type of competitive

incentive intervention. These interventions were termed "challenges" and varied in construct from week to week. The participants in the experimental group were given the following competitive incentive interventions (challenges): (a) week one challenge-individual competitions in small groups of equal ability, (b) week two challenge-intergroup competition and (c) week three challenge-individual competition in one large group of varying ability.

Intervention one: Competitions in small groups of equal ability. In the first intervention participants in the experimental group were assigned to specific physical activity/ability groups based on the results of their baseline step count data. Group A (sedentary-0-4,999 step baseline mean) had three members, Group B (low activity-5,000-7,499 step baseline mean) had 7 members, Group C (somewhat active-7,500-9,999 baseline step mean) had 5 members and Group D (active to highly active-10,000 steps or more for baseline mean) had 5 members. Participants in the experimental group were invited to accept the challenge from either the email invitation they received or through their online HealthMiles accounts.

Each of the ability groups were engaged in their own competitive incentive intervention or "challenge". The challenge stated the following: "You have been challenged to get the most steps in one week, to accept this challenge click on the link or sign in to your Virgin HealthMiles account." Once participants accepted the challenge they were able to view their own steps progress, the step totals of the others engaged in the same small group competition, and their standings in comparison to the other members of their specific group. The researcher initiated four challenges simultaneously, one for each of the specific ability groups. The intervention lasted one week, at the end

of the week, step counts were collected from all participants in both of the groups, control and experimental. The participants in the control group did not receive any challenge interventions but they were able to see their own step counts.

After the challenge for week one had ended, the researcher sent the participants a congratulatory email, listing the winners in each of the groups' competitive challenges. The researcher collected data from the participants in the experimental group and compared it to both their own baseline data using paired t-tests, and also to the data collected from the control group for the corresponding week of non-intervention using unpaired t-tests. Step count data from both the control and experimental groups were programed into the Microsoft Excel and SPSS data analysis programs where t-tests were used to determine if any significant differences were evident.

Intervention two: Intergroup competition. For the second intervention, the small groups did not change; this was done in order to prevent individuals from having feelings of inadequacy when seeing their steps compared to someone with a substantially higher step counts. For this intervention, participants in the experimental group were competing with their small groups as a team to reach a goal. The goal was to be the group that had the most team members increase their daily steps from their baseline data by 2,000, most often, for the duration of one week. Along with the ability to accept this challenge through their online account, the researcher sent an email inviting participants to the challenge that listed the challenge criteria. The participants in the control group did not receive any challenge interventions but they were able to see their own step counts.

After the challenge for week two had ended, the researcher sent the participants a congratulatory email, listing the members of the group winning the team challenge. The researcher collected data from the participants in the experimental group and compared it to both their own baseline data using paired t-tests, and also to the data collected from the control group for the corresponding week using unpaired t-tests. Step count data from both the control and experimental groups were programed into the Microsoft Excel and SPSS data analysis programs where t-tests were used to determine if any significant differences were evident.

Intervention three: Competition in one large group of varying ability. The third and final intervention was a large group challenge among those with varying abilities. The researcher sent out the final competitive incentive details by email and the participants were also able to accept the challenge through their online accounts. The challenge was similar in design to the challenge from week one to "get the most steps in one week", however, this time each member of the experimental group was competing against all the other members of the experimental group. Participants checking their progress during this intervention were able to see the step count totals of all the participants in the experimental group. The participants in the control group did not receive any challenge interventions but they were able to see their own step counts.

After the challenge for week three had ended, the researcher sent the participants an email, listing the winner of the final challenge. The researcher collected data from the participants in the experimental group and compared it to both their own baseline data using paired tests, and also to the data collected from the control group for the corresponding week using unpaired t-tests. Step count data from both the control and

experimental groups were programed into the Microsoft Excel and SPSS data analysis programs where t-tests were used to determine if any significant differences were evident.

Interpreting Accumulated Data

After the data had been collected from all of the intervention weeks it was then programmed into the Microsoft Excel data analysis program where t-tests were conducted between each of competition weeks in order to determine if any significant differences were evident in the participants. Paired t-tests were also conducted for the participants in the control group between their baseline data and each week that no intervention was administered to determine if any significant differences were evident for their weeks of non-intervention.

Summary

Data were collected from the control and experimental groups throughout the duration of the study. The researcher analyzed data in a variety of ways to determine if any significant differences in step counts were being exhibited by the participants. Both the Microsoft Excel and SPSS data analysis programs were used for the data analyses.

The data analyses can be broken down into four categories: (a) both the control and experimental group's step count data from each intervention or non-intervention was compared to their own baseline data using paired t-tests, (b) the experimental group's step count data from each intervention week was compared to the data collected from the control group during their corresponding week of non-intervention using three independent unpaired t-tests, (c) the control and experimental group's total mean step amounts during all weeks of intervention/non-intervention were compared by conducting

an unpaired t-test, and (d) the data collected from the experimental group for each type of intervention was compared to the other types of interventions administered to determine if any significance existed regarding the type of intervention being administered. The researcher had to exclude participants from portions of the data analysis when conducting paired t-tests as some participants did not have accurate data for the third and fourth week of the study. All 40 participants were able to get accurate measures during the first two weeks of the study.

Chapter Four: Results and Discussion

Introduction

Data was collected over the period of four weeks, and three interventions were administered to the experimental group. The findings generated on the 40 participants were done using independent and dependent t-tests. The researcher was able to: (a) obtain participant baseline data (pre-intervention), (b) categorize participants into equal and random groups (control and experiment), (c) collect participant's data after three challenge interventions, and (d) analyze the experimental group's data when compared to the control group and to their own baseline measure. The study sample size included 40 participants working at the Braham School District, located in Braham Minnesota. Some of the participants' data had to be excluded from portions of the analysis as they were unable to collect accurate data.

Participants

There were 40 participants from the possible sample size of 100. The participants gave their consent to be a part of the study. The participants in the study included: teachers, administrators, secretaries, paraprofessionals and additional support staff (i.e., community education, human resources, cooks, bus drivers and custodians). Certain characteristics of the sample size such as age, extracurricular involvement, illness or injury, job title, and individuals taking vacations may have affected the results of the study. For any paired tests, participants having accurate baseline data that later broke or lost their pedometer, or otherwise dropped out of the study, were excluded from portions of the study. Two of the participants that were excluded from portions of the study had participated in a walk-a-thon, causing dramatic increases in their steps counts.

Results

The following null hypotheses were considered when analyzing the data obtained while conducting the study:

(1) Null Hypothesis: There will be no significant difference in the amount of total steps taken by individuals that participated in pedometer program when competitive incentives were used verses the amount of total steps taken by the participants when no competitive incentives were used. **Reject Null Ho*

(2) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in small groups of equal ability as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used. **Fail to Reject Null Ho*

(3) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in intergroup competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used. **Reject Null Ho*

(4) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in a large group competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used. **Reject Null Ho*

(5) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses intergroup competition as competitive incentive. **Fail to Reject Null Ho*

(6) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses large group competition as competitive incentive. **Fail to Reject Null Ho*

(7) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in large group competition as competitive incentive verses intergroup competition as competitive incentive. **Fail to Reject Null Ho*

(8) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when small groups of equal ability were used as competitive incentive and cash and/or prize incentives were not offered. **Reject Null Ho*

(9) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when intergroups were used as competitive incentive and cash and/or prize incentives were not offered. **Reject Null Ho*

(10)Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by the participants verses the amount of steps taken when one large group competition was used as competitive incentive and cash and/or prize incentives were not offered. **Reject Null Ho*

The researcher placed equal step (physical activity) achievers in two groups then randomly assigned the experimental and control group. No significant differences were seen in the amount of steps being achieved by the participants in the experimental and control group for their baseline measures. Additionally no significant differences were seen by the participants in the control group when comparing their non-intervention weeks to their own baseline data.

Table 1

Summary of a two-tailed, unpaired t-test and the Means (M), Standard Deviations (SD) and the Probability (p) values on the Effect of Competitive intervention and Non-intervention between the Control and Experimental Group for total weeks.

Group	M (SD)	t-value	p
Control	8,048.74(4108.59)	1.645	.0018
Experimental	11,087.36(5740.50)		

The results in Table 1 were obtained by conducting two-tailed unpaired t-tests. Results showed (Table 1) that the participants in the experimental group took significantly more steps then the control group did when comparing the experimental group's overall step mean during the intervention weeks to the control group's overall step mean during their corresponding week of non-intervention. The findings presented in both Tables 1 and 2 were similar to what previous researchers had suggested about the effectiveness of pedometer programs (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). The data shown in Tables 1 and 2 also answered the questions that Kang and colleagues (2009) and VanWormer and colleagues (2006) had addressed regarding the effectiveness of the motivational attributes associated with pedometer programs. To

answer the questions of Kang and colleagues (2010) and VanWormer and colleagues (2006), the results in these two Tables (1 & 2) suggest that cash and/or prize incentives are not necessary to motivate the participants in pedometer programs to take more steps. The researcher was able to reject the first null hypothesis based on the results shown in Table 1.

Table 2

Summary of two-tailed, unpaired t-tests, Means (M), Standard Deviations (SD) and the Probability (p) values between the Control and Experimental Group for each week of Intervention and Non-intervention

Group	Intervention/Non	M (SD)	t-value	p
Control Experimental	Non-Intervention Small Group Equal	9,232.67(5,257.52) 10,418.89(5,018.01)	2.021	.2349
Control Experimental	Non-Intervention Intergroup	7,416.50(3,371.80) 11,645.62(5,714.42)	2.03	.0053
Control Experimental	Non-Intervention Large Group	7,325.31(3,051.25) 11,282.70(6,757.99)	2.021	.0192

Table 2 represents the output of data from unpaired t-tests for each week of intervention compared with non-intervention, after baseline. Data were analyzed this way to determine which week(s) were specific to the significance being suggested by the overall analysis of total weeks (see Table 1). In the results shown on Table 2, the participants in the experimental group took significantly more steps then the participants in the control group during both the intergroup and large group competitive interventions. The results shown in Table 2 regarding small groups of equal ability contradicted the suggestions of Garcia and Tor (2009) as it was determined that no significant increases were seen when small groups of equal ability were used as the type of competitive

incentive. Garcia and Tor (2009) had suggested an increase in motivation was evident for individuals competing in small groups of equal ability however the results in Table two suggest otherwise as p>.05 = .469. The results shown in Table 2 caused the researcher to fail to reject null hypotheses 2 and reject null hypothesis 3 and 4.

Table 3

Summary of two-tailed paired t-tests, Means (M), Standard Deviations (SD) and the Probability (p) values between the Experimental Group's baseline steps and each week of Intervention.

Time	n	M (SD)	t-value	p
Baseline	20	8,163.35(3,364.34)	-3.83	.003
Small Group	20	10,418.89(5,018.01)		
Baseline	19	8,349.05(3,350.62)	-3.54	.002
Intergroup	19	11,239.31(5,828.99)		
Baseline	18	8,496.78(3383.49)	-2.28	.036
Large Group	18	10,820.75(6842.88)		

In Table 3, the experimental group's baseline step means were compared to their individual intervention step means, per intervention week, by conducting paired t-tests. Only participants having accurate data for the corresponding weeks of study were eligible for portions of this study. When looking at Table 3 it is evident that the participants in the experimental group took significantly more steps during their weeks of intervention then they took during their baseline week, furthermore, they did so when cash and/or prize incentives were not offered during their weeks of competitive intervention. The researcher was able to reject null hypotheses 8-10 as significant increases in step counts were seen (Table 3) in the participants when competitive incentives were used and not cash and/or prize incentives. The data shown on Table 3 also answered the questions

asked by previous researchers in the area of pedometer programs as is suggests that cash and/or prize incentives are not necessary to motivate participants to significantly increase their steps (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). This data (Table 3) would also suggest that many of the competitive theorists and researchers were accurate regarding their recommendations for best practices related to competitive interventions, as all types of competition effectively motivated the participants to significantly increase the amount of steps they took (Allen & Hecht, 2004; Bar yam, 2003; Festinger, 1954; Garcia & Tor, 2009; Stanne et al., 1999; Tauer & Harackiewicz, 2004).

Discussion

The competitive incentive features associated with pedometer programs effectively motivated the participants in this study to significantly increase their physical activity outputs; furthermore, these features were able to trigger this motivation even when cash and/or prize incentives were not offered. Additional findings regarding the competitive incentive features used in this study suggested that the type of competitive incentive being implemented (small equal ability groups, intergroup, large group) did not have a significant increase or decrease effect on the participant's step counts. The study was limited to a small sample size (40) and some of the participants' data had to be eliminated for portions of the study when accurate step counts could not be obtained.

The majority of the participants in this study had data that could be used to answer the research questions. Within the experimental group the implementation of all three types of competitive incentives motivated the participant's to take significantly more steps then their baseline step amounts. When comparing the control and

experimental group, the initiation of both the intergroup and large group competitive incentive motivated the participants in the experimental group to take significantly more steps then the participants in the control group. These significant step increases were being made by the participants in this study when cash and/or prize incentives were not offered, suggesting that cash and/or prize incentives may not be necessary to motivate the participant's in pedometer programs to increase the amount of physical activity they are achieving.

After coming to the determination that the pedometer program had a significant effect on the participants, the types of competition being implemented were analyzed to determine if any significant differences were present. The reviewed research had suggested that all types of competition could have an effect on the motivational levels of the participants (Allen & Hecht, 2004; Bar yam, 2003; Garcia & Tor, 2009; Festinger, 1954; Stanne et al., 1999; Tauer & Harackiewicz, 2004). The research done by Garcia and Tor (2009) suggested that competition among small groups of equal ability would lead to enhanced levels of motivation, however, no significant differences were found in the type of competition being administered and the amount of steps the participants were taking. The competitive incentive interventions implemented during this study were based on the suggestions of previous researchers in the area of pedometer programs. Past researchers and theorist had suggested that competition had an increased effect on an individual's motivational level (Allen & Hecht, 2004; Bar yam, 2003; Garcia & Tor, 2009; Festinger, 1954; Stanne et al., 1999; Tauer & Harackiewicz, 2004). The results regarding the competitive incentive features in this study suggest that there is correlation

between competition and motivation, and furthermore, correspond with what previous researchers have suggested.

Summary

The data collected was analyzed using a variety of methods in both the SPSS and Microsoft Excel data analysis programs. The following comparisons were used for the overall analyses of the data: The step data for both the experimental group and the control group were compared throughout the duration of every intervention or non-intervention in total (Table 1) and then compared by specific intervention type (Table 2), the experimental group's baseline data measures were compared to their step data for each week they experienced an intervention (Table 3), and the experimental group's step counts for each intervention week were compared with the other types of interventions (no significance).

To obtain the results shown in Tables 1 and 2, participant step counts were entered into the Microsoft Excel program where two tailed, independent t-tests were conducted. Each participant had usable data for their baseline measures and for the first intervention week. When comparing the two groups (control and experimental) the results (Table 1) suggested that the experimental group took more steps then the control group. When comparing the two groups (control and experimental) corresponding weeks of intervention and non-intervention, all but one of the types of competitive incentive interventions (small groups of equal ability) motivated the participants to significantly increase their steps (see Table 2).

When analyzing the experimental group only (see Table 3), participant step counts were entered into the SPSS program where paired two-tailed t-tests were done to

determine if any significance differences were present. It was determined that the competitive challenge features of the pedometer program motivated the participants to significantly increase their step amounts when no cash and/or prizes were offered during each week of competitive incentive intervention as $p<.05$ for all weeks (week one $p=.003$, for week two $p=.002$ and for week three $p=.036$).

After analyzing the compilation of data, the researcher failed to reject null hypothesis 2 as the participants the experimental group did not take significantly more steps then the control group during the competitive incentive intervention among small groups having equal ability. The researcher then compared the types of competitive incentives with each other and failed to reject null hypotheses 5-7 as no significant differences were evident in the type of competitive incentive intervention being administered. The researcher was able to reject null hypothesis 1 as the participants in the experimental group took significantly more steps in total throughout the competitive incentive interventions weeks then the control group took for their corresponding weeks of non-intervention (see Table 1). The researcher examined specific weeks of competitive incentive intervention and was able to reject null hypotheses 3 and 4 as participants in the experimental group took significantly more steps the participants in the control group took during both the intergroup and large competitive incentive intervention weeks (see Table 2). When examining the experimental group's data (see Table 1) the researcher was able to reject null hypotheses 8-10 as the participants in the experimental group took significantly more steps during all three weeks of competitive incentive intervention then they took during their own baseline weeks and cash and/or prize incentives were not offered.

Chapter Five: Conclusions and Recommendations

Introduction

The amount of overweight and obese adults continues to be a problem in the United States despite the many health benefits associated with living a physically active lifestyle **(**Flegal, Carroll, Ogden & Curtin, 2010; NCHS, 2008; USDHHS, 2008; WCRF/AICR, 2009). Pedometer programs have been implemented across the nation and have additionally provided researchers with evidence to suggest that these programs are effective when they are used to motivate physical activity increases in their users in small populations by using cash and/or prize incentives in combination with the features made possible by these programs (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). With many employers having limited funds, these types of programs may not be ideal for targeting a large population. In order to determine if these programs could implemented among a larger population, the researcher isolated the competitive features associated with these programs and did not use any cash and/or prize incentives to assist in motivation.

The participants in the study conducted were a sample of adults in the workplace from, representing a rural Midwestern community. The population size was smaller than desired when conducting any experiment but larger than expected when examining the population targeted for the study. The number of participants used for analysis in portions of the study ranged from 36-40 due to external factors affecting the accuracy of the data they had collected. The null hypotheses were:

(1) Null Hypothesis: There will be no significant difference in the amount of total steps taken by individuals that participated in pedometer program when

competitive incentives were used verses the amount of total steps taken by the participants when no competitive incentives were used.

(2) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in small groups of equal ability as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(3) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in intergroup competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(4) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants when they were engaged in a large group competition as competitive incentive verses the amount of steps taken by the participants when no competitive incentives were used.

(5) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses intergroup competition as competitive incentive.

(6) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in small groups of equal ability as competitive incentive verses large group competition as competitive incentive.

(7) Null Hypothesis: There will be no significant difference in the amount of steps taken by the participants in the experimental group when they were engaged in large group competition as competitive incentive verses intergroup competition as competitive incentive.

(8) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when small groups of equal ability were used as competitive incentive and cash and/or prize incentives were not offered.

(9) Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by participant's verses the amount of steps taken when intergroup were used as competitive incentive and cash and/or prize incentives were not offered.

(10)Null Hypothesis: In the experimental group there will be no significant difference in the amount of baseline steps taken by the participants verses the amount of steps taken when one large group competition was used as competitive incentive and cash and/or prize incentives were not offered.

Conclusions

The conclusions drawn from the study were limited as the population size was small and due in part to the participant's extracurricular activities and pedometer maintenance. The t-tests conducted through Microsoft Excel and SPSS programs provided evidence suggesting that pedometer programs were effective when no cash and/or prize incentives were offered to the participants.

The researcher was able to obtain accurate results by analyzing the data using both Microsoft Excel and SPSS analysis programs. The step counts for both the baseline week and first week of intervention may have been higher for all participants as the program was new and every participant was able to see their own step data. However, the differences seen between both the control group and the experimental group, and the experimental group and their baseline data, suggest that the competitive features associated with pedometer programs can be used tools that motivate participants to significantly increase their physical activity when implemented in a variety of settings. Furthermore, the control group's step count data was analyzed when no competitive features or cash and/or prize incentives were offered and they showed no significant increases in physical activity. The researcher designed the experiment in a way that the competitive incentive features associated with pedometer programs could be isolated and analyzed regarding their effectiveness. The was done as a result of the recommendations that were given by other researchers who had explored similar programs and who were suggesting that a study needed to be done in order to determine which elements were responsible for the physical activity increases being seen.

Recommendations

In order to change the trend being seen related to amount of obese or overweight adults currently residing in the United States, physical activity programs were examined to determine their effectiveness. Overall pedometer programs have been quite popular among researchers when determining effective ways to motivate individuals to increase the amounts of physical activity they achieve. The recommendations regarding the findings in the study were based on two problems. The first problem addressed by this

study was the amount of obese or overweight adults residing in the United States as a result of not getting enough activity. The researcher discovered an additional problem within the pedometer programs that had been studied, as the majority of the programs being analyzed had offered costly incentives that could increase the risk of individuals inflicting harm to themselves or on others (Malhorta, 2010) and furthermore, could not be widely used by employers and healthcare advocates due to the high cost association (USBLS, 2012). Further conclusions and limitations given by the researchers, regarding previous studies done on pedometer programs, were that they could not determine which features of the programs were primarily responsible for motivating the participants to increase their physical activity (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006).

Recommendations for implementation. Research has been done on the relationship between pedometer programs and the physical activity increases being exhibited by their participants (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Throughout the research reviewed on pedometer programs, the researchers had similar limitations associated with their studies or reviews, suggesting that they were unable to isolate the program features responsible for motiving the participants to increase their step amounts (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). The researchers were questioning whether the offering of cash and/or prize incentives, the goal setting feature, the implementation of a competitive incentive or a combination of these features were primarily responsible for motivating the participants to take more steps (Foster et al., 2010; Kang et al., 2009; VanWormer et al., 2006). Further research regarding cash and/or prize incentives being offered and it was

determined that by doing so, one may produce unfavorable results (Malhorta, 2010). It would be suggested that individuals administering these types of programs use methods other than cash and/or prize incentives to motivate their participants.

The research done on competitive motivation suggested that small groups of equal ability could enhance motivation (Garcia & Tor, 2009) along with large group competition also having an effect on an individual's motivation (Festinger, 1954). Further findings on competitive motivation suggested that intergroup competition would create cooperation and have an increased effect on motivation, task completion and overall enjoyment (Allen & Hecht, 2004; Bar Yam, 2003; Stanne et al., 1999; Tauer & Harackiewicz, 2004). These pieces of research were used to design a pedometer program that effectively motivated the participants to increase the amount of physical activity they were getting. Based on the findings that the control group did not have significant increases in their step counts, the researcher would also suggest that there is a need for a pedometer program administrator to monitor the program and set up any interventions based on past practice.

Recommendations for promotion. It would be the recommendation of the researcher that more employers and healthcare advocates initiated and promoted these types of pedometer programs. Health insurance providers should be targeted as an entity that could cover the cost of the pedometer devices and any associated membership fees particular to the program being implemented. If health insurance companies covered these associated fees, healthcare advocates and employers wanting to administer these programs would be able to target a larger population.

Recommendations for further research. There are many corporations currently implementing pedometer programs across the nation. Kemps, Midwestern Public Schools, the Virgin Corporation, Security Service Federal Credit Union and communities like Bexar County, have begun to implement pedometer programs with the hope that more of their employees or community members will start to get the recommended amounts of physical activity (Boyce, 2011). Bexar County has nearly 500 community members that are currently enrolled in the Virgin HealthMiles pedometer program. Places like OCHSNER Health system, a Louisiana based healthcare system, have 10,000+ employees with 81% enrolled in the Virgin HealthMiles program (Boyce, 2011). Any recommendations being made by the researcher were limited to the population sample used in study. Data taken from the organizations listed, and others conducting similar types of pedometer programs, should be analyzed so a larger sample size could be used for adequate research. Competitive incentives could be compared to cash/and or prize incentives regarding the effect they have on an individual's motivation. In doing so, further recommendations regarding best practices for pedometer program implementation could be made.

Observations

When looking at Table 2, observations were made regarding the results of the analysis. The participants in the control group had a step mean of 9,232.67 for their first week of non-intervention and for the following weeks of non-intervention the mean of the group decreased. The mean amount of steps for the control group during week two was 7,416.50 and during week three, there step count mean was 7,325.31 (see Table 2).

The researcher further explored the change in the control group's step count means for non-intervention weeks.

Observations regarding baseline measures. The first observation was that over time, individuals using pedometers without interventions experienced a decrease in steps or physical activity. The decrease could have been due to the fact that program was new, and it triggered an increase in motivation for the participants equally in both groups, as they were able to view the amount of steps they took on their pedometers and when they logged into their online accounts. The excitement associated with the introduction of new programs, similar to the one used in the study, could have also motivated the participants in both groups to take more steps and therefore have "higher than actual" baseline means.

In order to have eliminated or decreased the limitations associated with the excitement of the new program, the researcher would have liked to collected data from the participants for two weeks or up to a month, and used that data for the participant's baseline measures. The excitement levels of the participants in both groups would have most likely decreased after the first two weeks of the program (see Table 2), getting a more accurate measure, however, even if the measures of baseline were "higher than actual" the participants in the experimental group still took significantly more steps during the intervention weeks then during their baseline week. The program used in the study was not effective when attempting to increase the participant's steps unless the competitive features were also used to trigger or increase motivation.

Observations regarding intergroup theory. A third observation was made regarding the week of intergroup competition as competitive incentive (see both Tables 2

and 3). The participants in the experimental group had their highest mean step amount of 11, 645.62 and lowest p value of .0053 during the intergroup competitive incentive when compared to the control group and also had their highest mean step amount of 11.239.31 and lowest p value of .002 for this type of competitive incentive when compared to their own baseline steps. Although no significant differences were found when comparing the types of competition, it was observed that the participants had their highest step count means during the intergroup competitive incentive.

Observations regarding participant response. Additional observations made by the researcher were that the participants had an overwhelmingly positive response to the program. Along with emailing the researcher about how they had begun to make lifestyle changes such as: Parking further from shopping establishments, walking to the mailbox to get the mail, going for a walks with loved ones, and having increased passion for exercise; participant's from both groups seemed to have an overall positive attitude towards the others involved in the program and were making several social contacts with each other throughout the workday as a result. The researcher would have liked to collect qualitative data during the study as well, but the sample population that conducted the pilot trial of the program was too small to set up any valid research prior to the pedometer program being implemented and the study beginning.

Summary

Pedometer programs similar in design to the one conducted by the researcher could be implemented across the United States, to increase the amount of adults currently getting the recommended amount of physical activity. Through conducting the experiment, the researcher observed the participants of the experimental group exhibit

significant increases in their physical activity when compared to their own baseline measures and when compared to the control group. Furthermore, the researcher did not offer participants from either group cash and/or prize incentives. Knowing that pedometer programs can be effective without having to offer cash and/or prize rewards protects participants from getting the "winning at any cost" mentality (Malhorta, 2010) and additionally allows for healthcare advocates and employers to target a larger population to increase the amount of physical activity they are getting. Once healthcare advocates and employers know that these programs are both effective and affordable, implementation will grow, resulting in an increase in the amount of adults getting the recommended amounts of physical activity and a decrease in the amount of overweight or obese adult's populating the United States. The research, although limited to a small sample size, suggests that cash and/or prize incentives are not necessary to motivate the participant's in pedometer programs to significantly increase the amount of physical activity they are achieving.

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