THESIS

EXERCISE GOAL ACKNOWLEDGMENT AND ITS EFFECTS ON SHORT-TERM EXERCISE

Submitted by

Charles Heidrick

Department of Psychology

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Fall 2015

Master's Committee:

Advisor: Daniel Graham

Brian Butki
Kathryn Rickard

ABSTRACT

EXERCISE GOAL ACKNOWLEDGMENT AND ITS EFFECTS ON SHORT-TERM EXERCISE

Regular physical activity has been shown to have substantial physical and mental benefits, ranging from protection against obesity to greater quality of life (Harvard School of Public Health, 2014; Faulkner & Taylor, 2005). Yet, a low percentage of people in the United States meet recommended levels of physical activity (Troiano et al., 2008). Goal setting has been shown to be an effective way to improve behavior (Locke & Latham, 1990; Latham & Budworth, 2006), but may be impacted by underexplored social factors. This study examined the role that another person, apart from the goal-setting exerciser, can have on physical activity goal pursuit. College students (n = 143) participated in a controlled experiment. A researcher demonstrated four exercises (push-ups, planks, jumping jacks, and single-leg balancing), after which participants set personal goals regarding their own imminent performance of these exercises. Participants were randomly assigned to one of three conditions: 1) private goals: participants set goals and did not share them with experimenter; 2) acknowledged goals: participants' goals were positively acknowledged by experimenter; 3) unacknowledged goals: participants gave their goals to an experimenter who did not provide acknowledgment. A significant effect of condition on performance and goal attainment was seen for planks and a significant effect of condition on goal attainment was seen for pushups. No significant effects were seen for jumping jacks or balancing. Results indicate positive effects of goal acknowledgment on subsequent goal attainment and

exercise performance and also suggest negative effects of having goals that could be acknowledged go unacknowledged.

TABLE OF CONTENTS

Chapter 1 - Introduction

Physical Activity Levels

There is a distressing trend occurring in the United States: a very high percentage of people understand the implications of a sedentary lifestyle, yet a similarly high percentage of people are engaging in just that: a sedentary lifestyle. In fact, 97% of Americans think that a lack of physical activity is a risk factor for health (Martin, Morrow, Jackson, & Dunn, 2000; Pate et al., 1995), and by one of the most objective measures of physical activity available, accelerometry, less than 5% of Americans adhere to physical activity recommendations (Troiano et al., 2008).

Physical Inactivity Health Risks

The implications of a sedentary lifestyle are a prime public health concern. Centers for Disease Control and Prevention (CDC) analyses show that physical inactivity was associated with nine-million cases of cardiovascular disease in 2001; this was estimated to cost the United States around $24 billion (Wang, Pratt, Macera, Zheng, & Heath, 2004). A meta-analysis determined that those who completed at least 150 minutes per week of moderate-intensity physical activity lowered their heart disease risk by 14% (Sattelmair et al., 2011). People who completed at least 300 minutes per week reduced their risk by 20%.

Physical inactivity also contributes to cancer, strokes, type 2 diabetes, depression, and dementia, among other chronic diseases (Mokdad, Marks, Stroup, & Gerberding, 2004; Bouchard, Blair, & Haskell, 2007; Katzmarkzyk, Gledhill, & Shephard, 2000; Physical Activity Guidelines Advisory Committee, 2008). A prime public health objective should be to increase the rate of physical activity among Americans.

Increasing Physical Activity Rates

If people understand the health implications of living a sedentary lifestyle, yet still remain inactive, does that mean that people simply do not want to be physically active? Not necessarily. Contrary to objective measures of physical activity (where less than 5% are meeting recommendation levels), self-report measures show that nearly half (48.1%) of Americans meet recommendation levels (National Center for Chronic Disease Prevention and Health Promotion, 2005). This discrepancy between objective and self-report measures of physical activity is strikingly large, and is likely due to multiple reasons. One is that Americans may simply think they are engaging in more physical activity than they really are (Baranowski, 1988); this may account for some of the discrepancy. But another reason is that Americans may be presenting themselves in what they perceive as a more favorable light to other people, themselves, or both (Warnecke et al., 1997). This latter reason would suggest that these people seem to at least care about physical activity levels to some degree: they value it for themselves or they recognize that most others value it. Without this value of physical activity levels there would be little reason to be dishonest. Therefore, not only it is intuitive to think that many Americans would like to engage in more physical activity than they currently are, but it seems as if the discrepancy between self-reported and objectively-measured physical activity data support that assumption as well.

This study aimed to gain a further understanding of factors that could act as either barriers or enhancers to increasing physical activity levels. Specifically, this study examined the role of goal acknowledgment from others in physical activity goal setting. Past research provided evidence that the role of acknowledgment in setting goals may be an important aspect related to different physical activity outcomes.

Also, psychological theories suggest that acknowledgment may have a substantial impact on the effectiveness of accomplishing one's health goals, yet there is a lack of research that looks at this specific relationship (goal setting and acknowledgment) – especially experimentally. If studied experimentally, causal factors impacting a person's physical activity levels after they set certain goals can be identified. This information has implications in multiple realms of society, including but not limited to: a personal trainer-trainee relationship, children's fitness in grade school (e.g., through the Presidential Fitness Challenge, which encourages kids to make health goals), a person making personal fitness goals for themselves, and also people making activity goals that may not be related to physical activity or fitness, but to a wide variety of other outcomes such as hours reading per week or time spent with family at night. Since the goals in each of these outcomes are capable of being acknowledged by others, the implications could be applied to those goals as well.

Health Benefits of Physical Activity

It is important to first establish the immense benefits that occur with regular physical activity. Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985, p. 126). In relation, a term that will be frequently used in this paper, exercise, is defined by the same authors as a structured time to engage in physical activity with the objective to improve physical fitness.

Mental Benefits

There are numerous mental benefits associated with physical activity, including decreased risk for depression and anxiety, improved self-concept, and a greater quality of life (Faulkner & Taylor, 2005). Physical fitness, or "a set of attributes that are either health or skill related" (Caspersen, Powell, & Christenson, 1985, p. 126), is intimately related to physical activity levels

and has been shown to be a crucial element in cognitive functioning (Kramer, Erickson, & Colcombe, 2006). Seligman and Csikszentmihalyi (2000) have shown that physical activity also makes what otherwise might be seen as a "normal life" more fulfilling.

Obesity

Currently in the United States there is an epidemic of obesity (condition where a person has accumulated excess body fat) and its related health concerns. According to 2011-2012 data from the National Health and Nutrition Examination Survey (NHANES), more than one-third of adults and nearly one-fifth of youth were obese (Ogden, Carroll, Kit, & Flegal, 2014). Obesity has been shown to influence the development of Heart Disease, Type 2 Diabetes, and many different types of cancer – which are but a few of obesity's possible negative health consequences (Centers for Disease Control and Prevention, 2013).

According the Harvard School of Public Health, physical activity protects against obesity in multiple ways, such as through increased energy expenditure and decreased body fat (2014). Also, muscle strengthening activities (such as weight-lifting) increase muscle mass; muscle strengthening activities therefore result in an increase in calories burned throughout the day (from rebuilding and increasing of muscle tissue), even while at rest (Harvard School of Public Health, 2014).

Chronic Disease Prevention and Recovery

Overall, the case for regular physical activity is strong. In 1994, The Surgeon General's Report deemed a lack of physical activity as one of the leading causes of all deaths. For the next decade and a half, it is estimated that physical inactivity in the United States contributed to roughly 200,000 deaths per year (Danaei et al., 2009). A study examining the relationship between physical inactivity and chronic disease found them to be "heavily correlated" and that physical

activity is now considered a "principal intervention for primary and secondary prevention of chronic diseases" (Durstine, Gordon, Wang, & Luo, 2013, p. 4).

Currently, overall death rates from cancer have been decreasing, but a report from the journal *Cancer* still concluded that "excess weight and a lack of sufficient physical activity contribute to the increased incidence of many cancers, adversely affect quality of life for cancer survivors, and may worsen prognosis for several cancers" (Eheman et al., 2012, p. 2338). Physical activity also seems to have an intimate relationship with stroke recovery. The American Heart Association found that functional ability after a stroke was significantly predicted by self-reported physical activity levels prior to the stroke (McDonnell et al., 2015). Finally, type 2 diabetes, a condition that is increasing in prevalence and is associated with a much shorter life expectancy, is more likely to develop in people who do not meet recommended levels of physical activity (Hordern et al., 2012).

Goal Setting

A technique to combat the public health concern of a lack of physical activity may be the setting of health goals. Simply setting health goals has been shown to improve health in relation to not setting any health goals at all (Locke & Latham, 1990). Beyond simply knowing whether or not to set any health goals, research also suggests it is important to know what type of goals to set and how to set them, and that this can have a substantial effect on behavior. What to do after setting a goal is less clear.

Although the theory of setting goals has received an abundance of research, it is ever-changing and cannot seem to find a permanent identity in the realm of physical activity. The most commonly known theory among goal research is named 'S.M.A.R.T.,' an acronym which calls for goals to be Specific, Measurable, Achievable, Relevant, and Time-targeted. But the principles of

goal setting also go beyond S.M.A.R.T. goals. Improved performance has been linked to goals that are not only easy, as might be implied by the 'attainable' criterion, but for difficult goals as well (Swezey, Meltzer, & Salas, 1994).

The mechanics of how setting goals improves performance and increases the rate of acquisition of desired outcomes has also been researched. According to Latham and Budworth (2006), in the workplace goals narrow attention, lead to higher levels of effort, cause more persistence, and lead to improved cognition in relation to the goal and the associated behaviors needed to accomplish it. In general, goals that are specific and high in difficulty increase performance by orienting an individual's attention, activating knowledge and skills related to the goal, and increasing persistence on goal-related tasks (Locke & Latham, 2013).

These studies argue and show that certain characteristics of setting goals leads to improved outcomes. But, goal *setting* strategies are not the only factors that go into goal accomplishment rates (how often one achieves a goal they set). There is less research on another aspect of goal accomplishment: goal *attainment* principles. These principles concern the actions one takes *after* setting a goal instead of the mechanics of how one *sets* a goal. Psychological theories make predictions for what people should do after setting a goal, but in order to have a better understanding of those predictions in the realm of physical activity, more research needs to be done that looks directly at the role of goal attainment principles *after* setting physical activity goals. That was a prime objective of this investigation.

Goal Setting and Physical Activity

This objective of understanding goal attainment principles is highlighted with the knowledge that goal setting in physical activity has shown mixed results. A literature review looking at goal setting as a strategy for physical activity behavior change found this strategy to be

inconclusive (Shilts, Horowitz, & Townsend, 2004). Although some studies found support for goal setting in increasing physical activity levels, overall only 32% of the studies fully supported goal setting as a strategy for physical activity behavior change. Considering that goal setting has been shown to be a good strategy in behavior change in other areas, it may be that there are unique barriers keeping people from accomplishing their physical activity goals.

A more recent review though of physical activity interventions found that self-regulatory techniques, which in many studies included goal setting, consistently increase the effectiveness of interventions to boost physical activity levels (Greaves et al., 2011). So although the effectiveness of goal setting in physical activity has room for improvement, it seems as if programs that intervene on physical activity should include goal setting as a strategy.

Goal Attainment Principles

There has been some research on positive goal attainment principles. An example of this is having proper feedback from an outside source (not yourself) during the process of trying to achieve your goal. Todd and O'Connor (2005) argued that providing feedback in the short term not only increases motivation but also the commitment level to achieve the goal. The researchers also found that feedback was more effective, resulting in higher percentages of goal accomplishment, when created in a context with positive language (from the person giving the feedback).

This research on feedback involves social factors for the accomplishment of a goal, and gives clues to the techniques for improved goal accomplishment. There is also some correlational research related to the social factors of health goals. Murcia, San Roman, Galindo, Alonso, and Gonzalez-Cutre (2008) found that when non-competitive exercisers were surrounded by peers who provided positive support, motivation and enjoyment of exercise increased.

Self-Determination Theory

Murcia et al. (2008) argued that one of the reasons this "peer motivational climate" of social support predicted both motivation and enjoyment of exercise was the perceived improved relatedness to their peers of those exercising. They described this process through self-determination theory (Ryan & Deci, 2000), which explains three psychological needs that must be fulfilled for optimal motivation towards an activity. The first is competence towards the activity, where the person feels as if they possess the aptitude to excel. The next is autonomy, where the person feels as if they control their own actions concerning the activity. Lastly, there is a need for a feeling of relatedness; this is the need to feel connected to others. Murcia et al. (2008) claimed that part of the reason for the motivation climate to increase motivation and enjoyment was through this concept of relatedness, where the exerciser felt more connected to those around them, and as a result experienced increased motivation and enjoyment towards the exercise activity, as would be predicted by self-determination theory (Ryan & Deci, 2000).

Through Murcia et al.'s (2008) research and experiments done in behavioral economics (detailed below), there are reasons to hypothesize that positive acknowledgment of exercise goals, rather than the absence of acknowledgment, could lead to better exercise performance. This body of research also suggests that positive acknowledgment would lead to better accomplishment of these exercise goals.

Manipulating Acknowledgment

Behavioral economics has shown how perceived meaning of a task, manipulated through differing levels of acknowledgment from a peer, can change the effort put forth towards the accomplishment of a task. Ariely, Kamenica, and Prelec (2008) observed this through a simple worksheet completion paradigm. They brought participants into a lab and had them fill out a

worksheet for a certain amount of money. The participants could keep filling out more worksheets for more money, but every subsequent worksheet earned them a little less money. The researchers found differences in how many worksheets the participants filled out through three different conditions. Their first condition involved the researchers taking every worksheet when the participant was done with them and looking over them slowly, nodding their head as they did so. This resulted in participants filling out the highest amount of worksheets. The second condition involved the experimenter taking every worksheet when the participant was done with each one and immediately placing it, face-down, on a table next to them without looking over it. This resulted in participants filling out a significantly smaller amount of worksheets than in the first condition. The last condition involved the researchers shredding each worksheet immediately after the participant completed each one, and this result was not significantly different to the second condition, but still resulted in significantly fewer worksheets being filled out than the first condition in which participants received acknowledgment from the researcher.

The researchers argued that the perceived meaning of the task at hand was altered by the level of acknowledgment the researchers showed towards the worksheets. When they acknowledged the participants' work by looking over it slowly, the participants perceived the task as having more meaning, and therefore filled out more worksheets.

Exercise Goals and Acknowledgment

Knowing that positive feedback can promote goal accomplishment (Todd & O'Connor, 2005), that enjoyment and motivation for physical activity is related to positive social support when exercising (Murcia et al., 2008), and that acknowledgment can play a role in the perceived meaning of a task (Ariely et al., 2008), there is reason to believe these concepts might interact. Together, they may point to the conclusion that an exercise goal could be perceived as meaning

less with less (or more negative) acknowledgment from a peer. Further, these lines of work together suggest that the lack of positive feedback could lead to decreased effort being put forth from someone who partakes in physical activity, especially when they expect some sort of feedback in a social setting. According to the self-determination theory, this "negative" or lack of feedback could decrease the perceived levels of relatedness between a goal setter and the person in the position to provide feedback, and therefore decrease the motivation of the one receiving negative (or not receiving any positive) feedback.

The Goal Acknowledgment Paradigm

The present study adapted Ariely et al.'s (2008) basic paradigm to an exercise-goal situation to observe the phenomenon seen in their study – that is, acknowledgment of something from an outside source improving behavior in some way, and the lack of acknowledgment worsening behavior. This paradigm had participants make goals that are relevant to a physical activity session that directly followed the goal setting. In one condition, the participants kept their goals to themselves and were told not to expect any feedback on their goals. In another condition, the participants gave their goals to an experimenter who provided positive acknowledgment of those goals. Lastly, a third condition had participants once again give their goals to an experimenter, but this time the experimenter ignored the goals and did not provide any feedback. It was hypothesized that positive acknowledgment of an exercise goal would lead to improved exercise outcomes over the absence of feedback, especially when feedback is possible. It was also hypothesized that when feedback is not possible, the absence of acknowledgment would have no effect on outcomes. There are two primary reasons that a condition with no possible feedback is being included: 1) as a control to see if positive acknowledgment improves outcomes and the absence of acknowledgment (when possible) worsens outcomes relative to a group in which no

feedback is possible, and 2) to expand the implications of the results to more individuals in situations outside of this study, where it is recognized that sometimes people in society keep their goals to themselves.

There are some distinct differences between Ariely et al.'s (2008) experiment and the one conducted here – in Ariely et al.'s (2008) experiment, persistence on the *same* task was assessed following different levels of peer-acknowledgment, whereas in this experiment, acknowledgment of the goal setting activity happens only once, and persistence is measured in a *separate* activity – the exercise itself. Therefore, for the hypothesis of this experiment to be correct, the goal setting and subsequent physical activity must be intimately related. There are strong reasons to believe that they are.

First, since the goal setting activity explicitly involves and describes the physical activity session, the physical activity session itself is analogous to the worksheet completion task. In other words, the worksheet completion task was a means unto itself, and the participants were aware of that. In this experiment though, participants are aware that the goals are a means unto something else: the upcoming physical activity session.

There is also another way to parallel the paradigm for this experiment to the worksheet completion task. The acknowledgment in Ariely et al.'s (2008) paradigm changed the perceived meaning of the worksheet that the participants were completing; in this experiment, the perceived meaning of the participants' goals may be what is changing. Fortunately, this is exactly what is of interest in this experiment. If the independent variable of interest did not involve goals, the connection between the two studies (the worksheet completion task and the proposed study here) would not be as meaningful. But, since goal attainment principles are of interest in this study, and social influences have been shown to relate to exercise quality (Murcia et al., 2008), this

connection of goal feedback and exercise quality is what the present study is testing. It is argued that goal feedback *is* a form of social influence, and therefore the act of providing goal feedback should be treated as a social situation. In the sense that feedback is a form of social influence, we could justify why the perceived meaning of the task in Ariely et al.'s (2008) paradigm changed. Ariely et al. (2008) argues that differing levels of acknowledgment come from recognition of one's work (or lack thereof), which results in differing levels of purpose felt in the activity - but their explanation stops there. This study sought to further explain what psychological phenomena may have been occurring in Ariely and colleagues' study, while also seeing the implications of a similar paradigm in a different field. Self-determination theory, along with the theory of planned behavior (detailed below), form the basis for the argument that peer-acknowledgment is indeed a social influence that can cause differing, tangible outcomes on multiple behaviors besides simply a worksheet-completion task.

Theory of Planned Behavior

There are other reasons, besides those provided by self-determination theory, to believe differing acknowledgment of physical activity goals may lead to differing exercise behaviors. A theory often used in health research is the theory of planned behavior (TPB; Ajzen, 1985). The TPB is a theory that predicts behavior by a person's attitudes, subjective norms (measured by asking respondents to rate the extent to which 'important others' would approve or disapprove of their performing a given behavior), and perceived control related to that behavior (Ajzen, 1991). Linking those predictors to this experiment may provide evidence that the independent variable of interest (acknowledgment) could be linked to physical activity behaviors.

The TPB has been shown to be a reliable predictor of physical activity behavior. A meta-analysis was conducted that examined the relationship between predictors from the TPB and

subsequent physical activity behavior. Seventy-two studies analyzed together revealed that the major predictors in the TPB (attitudes, subjective norms, perceived control) were supported in predicting physical activity (Hagger, Chatzisarantis, & Biddle, 2002).

Are any of the predictors in the TPB linked to the independent variable in this experiment? Returning to the definition of subjective norms, these are measured by the extent that 'important others' would feel about their behavior and whether they would approve or disapprove in them (Ajzen, 1991). 'Important others' may be linked to a person acknowledging goals. In the lab, the experimenter holds a position of authority, and in terms of the protocol of the experiment and giving directions for what behaviors to perform, he/she would be seen as a person of importance. In the real world, there are situations that would also parallel the one in the lab. In terms of a personal trainer and their trainee, the trainee has put him or herself in position to listen to the trainer because they believe the trainer *is* a person of importance, at least in terms of physical activity. If a person is making personal fitness goals by themselves without a personal trainer, it is intuitive to think that if they would show those goals to others, it would be someone who they highly value or believe possesses valuable information regarding physical activity. In either case, the person being shown the goals would be an important person in the context of that 'acknowledgment' situation.

Hypotheses

The expected variations between groups in the following hypotheses are due to the expected positive effects on physical activity (perceived effort, intrinsic motivation, and performance on varying tasks) of positive acknowledgment of related goals and negative effects on physical activity of no acknowledgment of related goals when acknowledgment is possible. It was expected that these effects (both positive and negative) would be absent when there is no

possible acknowledgment (when participant keeps their goals private). Therefore, the hypotheses for this experiment were as follows:

Hypothesis 1

Average exertion will vary by group. Participants who receive positive acknowledgment of short-term exercise goals from a peer prior to an exercise session will put more effort into that exercise session than participants who receive no acknowledgment when acknowledgment is possible. The absence of possible acknowledgment will result in levels of exertion between those demonstrated by the participants receiving positive acknowledgment and those expecting acknowledgment, but receiving none.

Hypothesis 2

Intrinsic motivation will vary by group. Participants who receive positive peer acknowledgment of short-term exercise goals prior to an exercise session will report more intrinsic motivation for that exercise session than participants who receive no acknowledgment when acknowledgment is possible. The absence of possible acknowledgment will result in levels of intrinsic motivation between those demonstrated by the participants receiving positive acknowledgment and those expecting acknowledgment, but receiving none.

Hypothesis 3

Performance on the exercise session, measured by the difference between one's goals and their repetitions of pushups and jumping jacks as well as duration of planks and foot balances, will vary by group. Participants who receive positive peer acknowledgment of short-term exercise goals prior to an exercise session will have better performance in that exercise session than participants who receive no acknowledgment when acknowledgment is possible. The absence of possible acknowledgment will result in levels of performance between those demonstrated by the

participants receiving positive acknowledgment and those expecting acknowledgment, but receiving none.

Chapter 2 - Method

Participants

One recruitment strategy was utilized. Students enrolled in PSY100, Introduction to Psychology, and PSY 250, Research Methods in Psychology, were recruited through the Department of Psychology at Colorado State University. Students enrolled in PSY100 and PSY250 are required to participate in research as a part of their course grade; they receive compensation for the time with course credit. Participants must have been in good enough physical condition to exercise for at least fifteen minutes at an intensity level of their choosing. This information was communicated to participants before they signed up for the experiment, and they each signed a consent form before participation detailing that they are in good enough physical condition to partake in the activity. It would have been ideal to recruit and run at least 144 participants total (~48 participants per condition) since a power analysis (GPower3.1.7; Erdfelder, Faul, & Buchner, 1996) suggested that ~48 participants in each of the three conditions would be sufficient to detect large-size effects with a high degree of confidence – 143 participants ended up participating in this experiment.

Procedure

Participants met the experimenter in a lab space at Colorado State University. The experimenter began by explaining the experiment to the participant. In this explanation was that the participant would be working out by conducting four different exercises, that the participant would be writing down and thinking about specific personal goals for their workout, and also that the participant would give their goals to the experimenter OR keep their goals private (this depended on condition) before beginning the workout. It was explained to the participant that the experimenter would be watching them go through their workout and would give them a report

afterwards on how hard they thought the participant worked and the quality of their workout. The experimenter did not actually give the participant a report on their workout, and this was explained to the participant in the debriefing. The purpose of this cover story was to create a more realistic situation, such as a personal trainer and their trainee, where the personal trainer (experimenter) is actively watching and evaluating the exercise session of the trainee (participant). The experimenter then gained informed consent from the participant. The experimenter then gave more detailed instructions regarding the exercise session in the experiment. These instructions included what specific four exercises the participant would be performing, which included planks (variations shown to accommodate different levels of physical fitness included planks held on forearms and toes, planks held on forearms and knees, and planks held on hands and toes such as the start of a pushup), pushups (variations shown included pushups on hands and toes, pushups on hands and knees, and pushups on hands and knees using a stable table as an incline), jumping jacks, and a one-foot balancing challenge. These four exercises were included to attempt to accommodate a wide array of fitness interests from participants and to have exercises that may generate large amounts of variation in performance from participants (if only a couple exercises were included and there was not much variation in performance, possible effects from the goal acknowledgment may not be exposed).

Also included in this explanation to the participants was that they were not to push themselves to their limits in performing these exercises (so as to avoid injury), but they were to try hard in order to receive an accurate gauge of their current fitness level. This explanation, along with the participants getting however much time they wished to warm up before conducting the four exercises, provided a blend of a safe experience for the participant while also getting accurate fitness and effort evaluations. Lastly, it was explained to the participant that they should write

down specific goals for each of the four exercises: repetitions of pushups they can accomplish, length in seconds they can hold a plank, the number of jumping jacks they can do in one minute, and how long they can balance on one leg with their eyes closed.

The experimenter then gave the participant a sheet of paper (Appendix A) and a pencil to write down their goals and to spend a moment thinking about those goals. When the participant was done, what the experimenter did with the goals depended on the participant's condition. In condition 1, the participant simply kept their goals for themselves. They had previously been told they would do this, so once they were done writing down and thinking about their goals, they simply moved on to the next part of the experiment. In condition 2, the experimenter took the goals, read the goals slowly, gave an approving "uh-huh" sound, and said "these look great!" before setting the goals face-up on a desk next to them. In condition 3, the experimenter took the goals and immediately set them on a desk next to them, face-down, without reading the goals. The participants knew if they were going to give their goals to the experimenter or not, but they were not told (in conditions 2 and 3) what they experimenter would do with their goals. This uncertainty reflected real-world social interactions in which people often do not know how others are going to react to information given to them.

Directions for Borg's Perceived Exertion Scale (Borg, 1998) were then explained to the participant. This scale was then administered directly after each of the four exercises. All participant exertion scores were then averaged to create an overall average perceived exertion score for their workout. The reason for doing multiple measures was to prevent bias that may be entailed during recall of one's workout.

The participant then conducted each of the four exercises, with every participant going through the same order. The experimenter recorded repetitions accomplished for pushups and jumping jacks as well as time accomplished in holding a plank and balancing on one foot.

The participant was then offered water and a quick break to rest before completing the remainder of the study. The participant was then given a survey packet that addressed demographic variables, how they felt after giving their goals to the experimenter (if they were in condition 2 or 3), intrinsic motivation, rejection-sensitivity, exercise-specific self-efficacy, and their exercise-specific social support. After completion of the packet, participants were measured for height and weight using a calibrated scale and stadiometer and then debriefed about the details and purpose of the study. Participants who were in condition 1 were also politely asked if they would be willing to now give their goals to the experimenter (all obliged). Finally, they were thanked for their participation. Participation lasted approximately 40 minutes. The experimenter then recorded the variation of pushups and planks the participant engaged in (they did not have to do this for jumping jacks and balancing on one foot since there were no variations of these exercises) and the goals the participants had made for themselves. Also on this sheet were space for the experimenter to write down their initials and the date of the experiment; the participant number and the randomly assigned condition was also listed. Lastly, the experimenter gathered and organized the materials from the experiment and made the room ready for the next participant.

Measures

Goal acknowledgment is the independent variable in this experiment. This variable has three levels: 1) acknowledgment not possible, 2) acknowledgment possible and received, and 3) acknowledgment possible but not received. There are six dependent variables in this experiment along with three potential covariates. The dependent variables are the participant's average

exertion (Borg, 1998), their intrinsic motivation (Ryan, 1982), and the goal-to-result difference for repetitions of pushups, seconds held in plank position, repetitions of jumping jacks in one minute, and seconds balancing on one foot with eyes closed. The potential covariates included the participant's rejection sensitivity (Downey & Feldman, 1996), their exercise-specific self-efficacy (Sallis, Pinski, Grossman, Patterson, & Nader, 1988), and their exercise-specific social support (Sallis, Grossman, Pinski, Patterson, & Nader, 1987).

Four of the dependent variables were exercise performance: this was measured by the goal-to-result difference for pushups, planks, jumping jacks, and balancing on one leg. For example, if a participant makes a goal to accomplish 20 pushups but only accomplishes 15, a goal-to-result score of -5 will be recorded in this measure (calculated from goal minus result). Fitness level is expected to be similar across conditions due to random assignment, but this goal-to-result measure is to protect against the possibility that similarity between conditions does not occur. If participants in one level of the independent variable outperform their goals while participants in a different level underperform, this would also be of interest relative to this study's hypotheses, even though their actual performance numbers could be identical. This will help protect against the fact that goal averages across conditions will likely not be the same.

Participants' perceived effort during the physical activity session is the next dependent variable, and was measured with Borg's Perceived Exertion Scale (Appendix B; Borg, 1998). This measure is simply a scale from 6 to 20 where 6 is "no exertion at all" and 20 is "maximal exertion." Participants point to a number that reflects their current feeling of exertion. This measurement was taken at multiple time points directly after the participant conducted each of the four exercises. The overall exertion level was then averaged to form a measure of that participant's effort during their physical activity session. The purpose of having this measure in

the experiment is that it allows for a measure of physical activity quality. Generally, in light of the fact that certain intensity levels of physical activity are needed to meet recommendation levels (Troiano et al., 2008), the more a participant is exerting themselves during their workout, the higher quality their physical activity session will be. If we found that one randomly assigned group exerted themselves more than the other, that result would be seen as a positive physical activity measurement that separates the groups in a meaningful way. Test-retest reliability for this scale has been found to be good, with correlations consistently being around 0.9 (Borg & Ohlsson, 1975; Ceci & Hassmen, 1991; Lamb, 1995; Eston & Williams, 1998). There has also been good evidence for the validity of Borg's Perceived Exertion Scale (Borg, 1977; Borg & Ottoson, 1986).

The next dependent variable is intrinsic motivation specific to the participant's exercise session (Appendix C). This scale was taken as part of a questionnaire the participants completed after their physical activity session. The purpose of having this measure is to determine if randomly assigned condition affects enjoyment and intrinsic motivation to engage in physically active behaviors (Ryan & Deci, 2000; Murcia et al., 2008). The interest and enjoyment subscale of the Intrinsic Motivation Inventory was used to assess this measure (Ryan, 1982). This subscale is regarded as the specific measure of intrinsic motivation for the relevant behavior in which a researcher is interested. The physical activity session in the experiment was the subject of the questions. Research has found the Intrinsic Motivation Inventory to be adequately valid and reliable in the realm of sports (McAuley, Duncan, & Tammen, 1989), and other experiments related to other forms of physical activity (endurance tests) have found it to be reliable as well (Tsigilis & Theodosiou, 2003). An example of a question on this scale is "I enjoyed doing this activity very much" which is then rated on a likert scale from 1 (not at all true) to 7 (very true).

Given the possibility that participants who could receive acknowledgment, but do not, might interpret this lack of acknowledgment as rejection, a potential covariate in this experiment is rejection sensitivity (Appendix D). A scale was used in the questionnaire that measures rejection sensitivity as "the disposition to anxiously expect, readily perceive, and overreact to rejection." The scale has shown good reliability (internal reliability: a = .83; test-retest reliability: a = 0.78) and good validity (Downey & Feldman, 1996). This scale gives examples of situations to participants, such as "you approach a close friend to talk after doing or saying something that seriously upset him/her" and then goes on to ask 1) how concerned or anxious they would be about their friend's response, and 2) how they would expect their friend to respond. Each of the eight items follows a similar pattern of concern/anxiety along with expectations in varying situations.

Another potential covariate in this experiment is physical activity-specific self-efficacy (Appendix E). This measure is included because self-efficacy towards physical activity has been found to be a very important predictor of subsequent exercise behavior (Rodgers & Brawley, 1991). The physical activity-specific self-efficacy measure for this experiment has been shown to be both valid and reliable (Sallis, Pinski, Grossman, Patterson, & Nader, 1988). Items in this scale are premised with the question "How sure are you that you can do these things?" An example item is "get up early, even on weekends, to exercise."

Physical activity-specific social support was another potential covariate (Appendix F). This potential covariate was included because some participants' higher initial levels of social support may act as a buffer to the 'rejection' of acknowledgment that exists in condition 3 (Cohen & Wills, 1985). This was assessed by a thirteen item scale that asks questions about support from family and friends in terms of exercise; this scale has shown acceptable reliability and validity

(Sallis, Grossman, Pinski, Patterson, & Nader, 1987). An example of an item on this scale is "During the past three months, my family (or members of my household) or friends gave me encouragement to stick with my exercise program."

Lastly, a demographic variable used was body mass index (BMI). To be able to calculate a person's BMI, participants' height and weight measurements were needed; these measurements were then used to provide a proportion of mass to height (kg/m^2). The higher that proportion is, the higher the person's BMI. BMI was used to obtain a measure of body fat percentage in our participants. Although BMI is not a direct measurement of body fat, research has shown that it correlates well with more direct measurements (Mei et al., 2002; Garrow & Webster, 1985). BMI has been shown to be significantly related to physical activity levels (Thorp, Owen, Neuhass, & Dunstan, 2011).

Analysis

First, all continuous outcomes were tested to ensure that they were normally distributed. Three methods were used to determine normality: 1) plotting of outcomes on histograms to visually observe normality, 2) computing Skewness and Kurtosis in SPSS (version 23.0, Armonk, NY), and 3) running the Shapiro-Wilk test of normality in SPSS. If an outcome was not normally distributed, either non-parametric tests were conducted that do not assume normality or the outcome variable was transformed before running parametric tests that do assume normality.

An analysis of variance (ANOVA) was then conducted for each potential covariate to see if they differed by level of the independent variable. If any potential covariate differed by condition, they would have been controlled for in the later analyses. ANOVAs were then used to measure the effect of our independent variable on the six dependent variables, using an alpha level of 0.05 to determine statistical significance. Chi-square analyses were then used to measure if goal

attainment differed by condition for each performance measure. Finally, correlation analyses were used to determine if any potential covariate variables correlated significantly with any dependent variables.

Chapter 3 - Results

Participant Characteristics

Demographics by condition can be seen in Table 1. Of 143 participants in the experiment, 58 identified as female and 84 identified as male. One participant did not specify their gender. The sample was composed primarily of first and second year undergraduates with a median age of 19 years old (M = 19.74, SD = 2.23). The sample was 73% Caucasian, 6% Hispanic, 4% Mexican, 3% Black, and 2% Chinese, while 12% identified as more than one race. Using measured height and weight to calculate body mass index (BMI), the sample was predominantly (85%) of healthy weight (BMI between 18.5 and 24.9), with 13% overweight (BMI between 25 and 29.9) and 2% obese (BMI > 30). The average height of females was 64.9 inches (5'4.9") with an average weight of 138.2 pounds (BMI: M = 23.1 kg/m^2, SD = 1.9). For males, the average height was 70.5 inches (5'10.5") with an average weight of 170.2 pounds (BMI: M = 24.1 kg/m^2, SD = 2.2).

Tests of Normality

All continuous variables were tested to ensure normal distribution. If variables were non-normal, transformations were attempted first to produce normality – if unsuccessful, non-parametric statistical tests were then used. There were three methods by which normality was tested. First, variables were plotted on histograms to visually assess normal distribution. Second, kurtosis and skewness were tested against a comparison of +- 3.29 for each statistic divided by their respective standard error. This number, with below 3.29 representing a normal distribution, was used due to the sample of this experiment being medium-sized (Kim, 2013). Lastly, Shapiro-Wilk's test of normality was used at an a level of 0.001 (Tabachnick & Fidell, 2007). A significant Shapiro-Wilk p-value signifies a non-normal distribution.

Rejection sensitivity showed a normal distribution with skewness of -0.271 (*SE* = 0.204) and kurtosis of -0.290 (*SE* = 0.406). Shapiro-Wilk's test of normality was not significant (p = 0.065). Physical activity-specific self-efficacy also showed a normal distribution with skewness of -0.397 (*SE* = 0.205) and kurtosis of -0.349 (*SE* = 0.407). Shapiro-Wilk's test of normality was approaching significance (p = 0.007). Physical activity-specific social support showed a normal distribution with skewness of 0.465 (*SE* = 0.203) and kurtosis of -0.208 (*SE* = 0.403). Shapiro-Wilk's test of normality was not significant (p = 0.023).

Exertion showed a normal distribution with skewness of -0.246 (*SE* = 0.203) and kurtosis of 0.414 (*SE* = 0.403). Shapiro-Wilk's test of normality was not significant (p = 0.186). Intrinsic motivation also showed a normal distribution with skewness of -0.270 (*SE* = 0.203) and kurtosis of -0.083 (*SE* = 0.403). Shapiro-Wilk's test of normality was not significant (p = 0.058).

The differences between participants' goals and their exercise outcomes were used to test normality for pushups, planks, jumping jacks, and the balancing exercise since these differences were used in the later Analysis of Variance (ANOVA) analyses. Pushups showed a non-normal distribution with skewness of 0.871 (*SE* = 0.206) and kurtosis of 3.472 (*SE* = 0.410), with Shapiro-Wilk's test of normality significant ($p < 0.001$). Log (base 10) and square root transformations were not able to produce a normal distribution, so a non-parametric analysis (Kruskal-Wallis) was later used for this variable. For planks, skewness of -0.226 (*SE* = 0.209) and kurtosis of 1.379 (*SE* = 0.414) signified a slightly non-normal distribution, but Shapiro-Wilk's test of normality was not significant (p = 0.011), indicating normality. After visually observing normality (Figure 1), this variable was used in a later ANOVA analysis. For jumping jacks, skewness of -0.701 (*SE* = 0.204) and kurtosis of 0.728 (*SE* = 0.406) also signified a slightly non-normal distribution, but once again Shapiro-Wilk's test of normality was not significant (p =

0.002), indicating normality. After visually observing normality (Figure 2), this variable was also used in a later ANOVA analysis. Lastly, the balancing exercise showed a non-normal distribution with skewness of 0.941 (*SE* = 0.206) and kurtosis of 1.562 (*SE* = 0.408), with Shapiro-Wilk's test of normality significant ($p < 0.001$). A log (base 10) transformation was applied and normality was produced, with this normal distribution having a skewness of 0.276 (*SE* = 0.206) and kurtosis of 0.984 (*SE* = 0.408). Shapiro-Wilk's test of normality was not significant ($p = 0.009$).

Major ANOVA Analyses

Before analyzing our dependent variables, each potential covariate was tested to confirm that they did not vary significantly by condition. None of the potential covariates, including rejection sensitivity, physical activity-specific self-efficacy, and physical activity-specific social support differed significantly by condition. Because of this, these variables were not controlled for in the major (ANOVA) analyses, although they were used in later correlation analyses to test if they were significantly related to any dependent variables (these findings can be found in Results subsection titled "*correlation analyses*"). Forty-six participants were randomly assigned to have private goals, 49 to have their goals acknowledged, and 48 to have their goals go unacknowledged when acknowledgment was possible. Goal averages, performance averages, and goal attainment percentages for each exercise by condition can be seen in Table 2.

First, a Kruskal-Wallis non-parametric analysis was used to test if pushup performance varied by condition due to this variable's non-normal distribution. The average difference from goal to result for each condition was used to measure performance. Data from three participants were dropped due to either not setting a goal for pushups or the variation they specified on their goal sheet did not match the variation they performed. When participants did not set a goal for an exercise, this was due to them not feeling comfortable making an estimation of their performance

because of their unfamiliarity with the exercise. For pushups, participants with private goals performed an average of 29.5 consecutive repetitions (*SD* = 15.7) with a +1.9 average difference from goal to result (meaning they outperformed their goal by 1.9 repetitions), 27.9 repetitions (*SD* = 12.3) for participants with acknowledged goals with a +1.8 average difference, and 30.2 repetitions (*SD* = 16.0) for participants with unacknowledged goals with a +2.0 average difference. The analysis showed that pushup performance did not vary by condition, $H(2, 138) = 1.426$, $p = 0.490$. A chi-square test of independence was then conducted to see if goal attainment differed by condition. The chi-square test showed that goal attainment differed significantly by condition, $X^2 (3, N = 140) = 7.14$, $p = 0.028$. Participants with private goals and acknowledged goals had significantly higher goal attainment rates (90.7% and 89.8%, respectively) than did participants who had goals go unacknowledged (73.0%).

Next, an ANOVA was used to test if plank performance varied by condition. Again, the average difference from goal to result for each condition was used to measure performance. Data from six participants were dropped due to either not setting a goal for planks or the variation they specified on their goal sheet did not match the variation they performed. For planks, participants with private goals held this exercise for an average of 79.0 seconds (*SD* = 35.3) with a +9.3 average difference from goal to result, 88.2 seconds (*SD* = 30.3) for participants with acknowledged goals with a +20.1 average difference, and 73.4 seconds (*SD* = 22.4) for participants with unacknowledged goals with a +7.5 average difference. The ANOVA showed that plank performance was superior for participants with acknowledged goals, $F(2, 135) = 3.32$, $p = 0.039$. Effect sizes were then calculated for the mean differences between conditions in standard deviation units. The largest effect size was between participants with acknowledged goals and participants with goals that went unacknowledged ($d = 0.486$). The next largest was between

participants with acknowledged goals and participants with private goals (d = 0.418). Lastly, the smallest effect size was between participants with private goals and participants with goals that went unacknowledged (d = 0.075). A chi-square test of independence was then conducted to see if goal attainment differed by condition. The chi-square test showed that goal attainment differed by condition, X^2 (3, N = 137) = 6.16, p = 0.046. Participants were most likely to accomplish their plank goal if they had their goals acknowledged (87.5%) rather than having private goals (76.2%) or having goals go unacknowledged (66.0%).

Next, an ANOVA was used to test if jumping jack performance varied by condition. Once again, the average difference from goal to result for each condition was used to measure performance. Data from two participants were dropped due to not setting a goal for jumping jacks. For jumping jacks, participants with private goals had an average of 65.9 repetitions (SD = 11.2) in one minute (+17.2 average difference from goal to result), 68.2 repetitions (SD = 6.5) for participants with acknowledged goals (+16.1), and 66.7 repetitions (SD = 9.3) for participants with unacknowledged goals (+16.0). The ANOVA showed that there was no significant difference in performance by condition, F(2, 139) = 0.087, p = 0.916. A chi-square test of independence was then conducted to see if goal attainment differed by condition. The chi-square test showed that goal attainment did not differ by condition, X^2 (3, N = 141) = 0.02, p = 0.990. Participants were equally likely to accomplish their jumping jack goal if their goals were private (86.7%), acknowledged (87.5%), or unacknowledged (87.5%).

Another ANOVA was then used to test if balancing performance varied by condition. Again, the average difference from goal to result for each condition was used to measure performance. Data from four participants were dropped due to not setting a goal for the balancing exercise. For balancing, participants with private goals held this exercise for an average of 36.3

seconds (*SD* = 34.7) with a -3.9 average difference from goal to result. Participants with acknowledged goals averaged 31.9 seconds (*SD* = 30.7) with a -4.7 average difference. Finally, participants with unacknowledged goals averaged 35.0 seconds (*SD* = 32.6) with a +4.6 difference. As showed by the ANOVA (using the transformed data), there was no significant difference in performance by condition, $F(2, 137) = 0.919$, $p = 0.401$. A chi-square test of independence was then conducted to see if goal attainment differed by condition. The chi-square test showed that goal attainment did not differ by condition, $X^2 (3, N = 139) = 0.18$, $p = 0.916$. Participants were equally likely to accomplish their balancing goal if they had their goals were private (44.4%), acknowledged (40.4%), or unacknowledged (43.8%).

Two ANOVAs also showed that intrinsic motivation and average exertion did not significantly differ by condition. Data from one participant was dropped in these analyses due to missing data. Participants with acknowledged goals had the highest intrinsic motivation scores ($M = 36.3$, $SD = 6.2$), followed by those with private goals ($M = 35.8$, $SD = 7.1$), and those with unacknowledged goals ($M = 34.9$, $SD = 5.9$), although the ANOVA showed that these differences were not significant, $F(2, 140) = 0.604$, $p = 0.548$. For average exertion, participants with unacknowledged goals had the highest average exertion score ($M = 12.8$, $SD = 1.6$), followed by those with acknowledged goals ($M = 12.6$, $SD = 1.3$), and those with private goals ($M = 12.2$, $SD = 1.8$). Again, an ANOVA showed that these differences were not significant, $F(2, 140) = 1.569$, $p = 0.212$.

Correlation Analyses

Correlation analyses were then conducted to observe the relationship between our potential covariates (rejection sensitivity, physical activity-specific self-efficacy, and physical activity-specific social support) and our dependent variables (performance measures, intrinsic

motivation, and exertion). A correlation matrix can be seen in Table 3 showing the relationship between each of these variables. Both physical activity-specific self-efficacy and physical activity-specific social support had moderate size correlations with multiple dependent variables. First, physical activity-specific self-efficacy had significant and positive correlations with intrinsic motivation ($r(138) = 0.220$, $p = 0.009$), pushup repetitions ($r(137) = 0.252$, $p = 0.003$), and plank seconds ($r(138) = 0.310$, $p < 0.001$), while physical-activity specific social support had significant and positive correlations with pushup repetitions ($r(140) = 0.177$, $p = 0.035$), jumping jacks ($r(141) = 0.176$, $p = 0.035$), and seconds balancing ($r(141) = 0.238$, $p = 0.004$). Rejection sensitivity was the weakest predictor and did not have significant correlations with any of the dependent variables.

Chapter 4 - Discussion

In this experiment a paradigm was created to observe the effects of goal-acknowledgment, or lack of goal-acknowledgment, on physical activity goals when acknowledgment may be received from another person. Participants were asked to set goals regarding four exercises they would subsequently perform. A third of participants were assigned to keep their goals for themselves and not show them to the experimenter. Another third gave their goals to the experimenter immediately after writing them and received positive acknowledgment of their goals. The last third of participants were also assigned to give their goals to the experimenter, but in their case the experimenter did not acknowledge their goals and instead immediately placed them, face down, on a large stack of papers. The results from this experiment support some hypotheses while providing no evidence for others – when one may receive acknowledgment, there seems to be some positive effects of having goals acknowledged and some negative effects of not having goals acknowledged. But, this effect was not seen across all dependent variables as hypothesized.

Pushups were the first exercise participants engaged in, and there was a significant effect of condition on goal attainment. Here, since participants with unacknowledged goals had a significantly lower goal attainment rate than both participants with private goals and participants who had their goals acknowledged, there seemed to be a negative effect in having goals go unacknowledged when acknowledgment was possible. Since we did not see acknowledgment enhance goal attainment rates over those who had private goals, this explanation of a negative impact of lack of acknowledgment seems the most plausible.

Planks were the next exercise participants engaged in and once again there was a significant effect of condition on goal attainment. For planks though there was also a significant

effect of condition on goal-to-result averages. Participants who had their goals acknowledged had significantly higher goal-to-result averages (meaning they outperformed their goals by the greatest margin) than participants in the other two conditions. For goal-to-result averages, there was no difference between participants with private goals and participants who had their goals go unacknowledged, which seems to point to performance enhancement by having goals acknowledged rather than goal determent from having goals go unacknowledged – the opposite of what was seen in pushup goal attainment. But, this conclusion is based off the assumption that participants who had private goals act as a "control" condition, which is not necessarily the case. Since these participants *knew* they would be keeping their goals for themselves (although they were asked for them back during the debriefing), this creates a second variable that is different from the other two conditions in addition to acknowledgment. Not only did they not get their goals acknowledged, they also would have never *expected* acknowledgment. For this reason, it may be more valid to only make conclusions about whether having goals be acknowledged is superior to having goals go unacknowledged when acknowledgment is possible (comparing conditions two and three), although from interpreting the results across all four exercises it does seem as if private goals are acting as a control since participants in this condition had relatively average performance numbers – meaning that when there were significant differences between conditions, participants with private goals had results in the middle of the three conditions. For example, for goal attainment rates in planks, the group that reached their goals was the highest in those who had their goals acknowledged, followed by lower rates by those with private goals, and finally followed by even lower rates by those who had their goals go unacknowledged when acknowledgment was possible. Here private goals seem to be acting as a control since those with

acknowledged goals saw significantly higher goal attainment rates, while those with unacknowledged goals saw significantly lower goal attainment rates.

There were no significant differences by condition for jumping jacks, the third exercise conducted, or the balancing exercise, which was the fourth and last exercise completed. There may be reasons for this lack of differences between conditions in these exercises: first, there may have been a ceiling effect for jumping jacks. This could be due to the fact that it would require extraordinary effort to fit a significantly higher amount of jumping jacks than average into one minute. Or, it is possible that differences in effort and physical fitness would not be expressed until two or three minutes of jumping jacks have taken place and fatigue has significantly set in. In addition, this exercise had the lowest goals being set for participants relative to actual performance, meaning that the vast amount of participants overall were exceeding their goals by a large margin, possibly further lowering their motivation to work extra hard to fit a lot of additional jumping jacks into one minute. The low standard deviations across all conditions for jumping jacks seems to indicate that their simply is not much variability to be expected in jumping jacks done in one minute among a healthy young sample.

As for the balancing exercise, there were very high standard deviations across all conditions, likely reflecting participants' lack of experience with the challenge. This lack of experience may have made it difficult for participants to make goals and subsequently have a decent chance at meeting them, as reflected in the low rates of goal attainment across conditions relative to the other three exercises. This difficulty may have decreased the chance that the manipulation would have an effect on results, but there are other reasons to consider as well.

The results across all four exercises suggest that the effect of goal-acknowledgment may be more related to physical challenges relating to one's persistence rather than physical attributes

such as speed or coordination. Concerning activities such as speed (jumping jacks) and balance (single-leg balancing), it becomes harder to see the role that determination or persistence plays. On the other hand, pushups and planks in the context of this experiment seem to be exercises related to persistence. Participants often have to be willing to push past a pain threshold when conducting pushups and a plank to failure rather than stop when it gets difficult. This is especially true for those who set difficult goals but have a chance to reach them. Goal-acknowledgment may make people more willing to push through a pain threshold when they perhaps know they could do more but may not want to. With jumping jacks, it is unlikely that the pain threshold would be reached unless participants were asked to do them for a much longer period of time than one minute. In the same manner, for balancing it would be unlikely that persisting through a pain barrier would play a role in performance unless participants were asked to hold a balance pose that is perhaps easier, but more uncomfortable, enabling them to hold the pose for much longer than our participants could hold an eyes-closed balancing pose. Further research can explore this acknowledgment and persistence relationship to understand not only the strength of its relationship, but also what other exercises it may extend to and in what contexts.

It is also important to consider that all participants did these exercises in the same order, and pushups and planks were the exercises closest to the act of positive acknowledgment of goals or no acknowledgment of goals. It is possible that the effect of this acknowledgment had worn off by the time the participants began jumping jacks, which was the third exercise conducted.

This order effect may have had an effect on results, but there are also reasons to believe it either did not have an effect or that the effect was minimal. First, the manipulation had more pervasive effects on planks than it did pushups (reflected in the significant effects of goal attainment *and* goal-to-result averages for planks), even though pushups were the first exercise

conducted and done immediately after the manipulation. Also, when goals were acknowledged they were placed face up in a visible place, while when goals were not acknowledged (but acknowledgment was possible) they were placed face down on a stack of papers in a visible place. The goal document was visible for the participant throughout the experiment and likely made the manipulation more salient for the participant throughout the experiment. Even with these reasons, future research would be wise to randomize the order of exercises to confirm that order does not have a significant effect on results.

The intrinsic motivation scale was assessed directly after participants were done with their exercise session, and the questions pertained to the activity they had just participated in (the exercise session). Although there were no significant differences by condition for intrinsic motivation, we did see expected differences in the hypothesized direction and may have simply needed more power to detect smaller effects. Future research that randomizes the order of exercises, or places pushups and planks at the end of the exercise session, may see a stronger result for intrinsic motivation due to the fact that the exercises done most recently are more salient in the participants' minds when completing the intrinsic motivation scale. Since the jumping jacks and balancing exercise were done at the end of the exercise session and there were no significant differences between conditions in these two exercises, having these two exercises be more salient than pushups and planks for participants when completing the intrinsic motivation scale may have lessened the effect of condition on answers to the intrinsic motivation scale.

Exertion also did not differ by condition. This may have been due to some confusion in the scale for participants. Although the scale, and its validated instructions that were read to every participant, put an emphasis on *physical* exertion and effort, many participants treated this scale as a rating of difficulty. For example, many participants reported high exertion scores after the

balancing exercise, even when they had performed the exercise for a little amount of time. There is no known reason to think that balancing would be more physically exhaustive than exercises such as pushups and planks, but it was definitely more difficult for most participants as not only had most of them not conducted it before, but it can be very difficult to do even with experience. Again, since the manipulation seemed to have an effect on persistence more than any other exercise variable, there is little reason why it would be expected to see differences in perceptions of the difficulty of tasks across conditions. So although persistence in the face of discomfort implies that more exertion would be needed, no differences may have been seen due to the fact that participants misinterpreted this scale to ask for something other than actual exertion.

A couple of the potential covariates in the experiment, which were measured in a questionnaire at the end of the participants' sessions, ended up being good predictors of dependent variables. Physical activity-specific social support and self-efficacy both had significant correlations with multiple dependent variables. This is not only intuitive (people who have more support and are more confident in an area are likely to perform better in that area than those who do not have support and are not confident), but it is also not surprising in light of Ryan and Deci's (2000) self-determination theory, where perceived competence (closely related to self-efficacy) and relatedness (closely related to social support) are essential for motivation and behavior to excel.

In addition to Ryan and Deci's (2000) work on self-determination theory, the results from this experiment coincide well with that of Todd and O'Connor's (2005) research. They argued that providing feedback in the short term not only increases motivation, but also the commitment level to achieve the goal. They also found that feedback was more effective in a context with positive language. Murcia et al. (2008) showed that a peer motivational climate of social support

predicts both motivation and enjoyment of exercise. When thinking of acknowledgment of goals as a type of social support, the results from this experiment clearly strengthen Murcia et al.'s (2008) claim regarding a positive effect of a peer motivational climate when engaging in physical activity.

This experiment, and its results, also closely mirrored that of Vallerand and Reid (1984), with a couple of important differences. Their study had participants conduct a motor task by doing a balancing challenge multiple times in 20-second intervals with 20 seconds of rest between intervals. The researchers only used participants that had at least a moderate level of intrinsic motivation for the balancing task. There were three conditions in their experiment: in one, participants received positive feedback during their balancing trials, such as being told they had a natural ability at the task. Another condition had participants hear negative feedback, such as their improvement between balancing trials was relatively slow. The last group did not get any feedback. Participants in the positive feedback condition reported the highest levels of intrinsic motivation for the activity, followed by those with no feedback, and then finally those who received negative feedback – and these differences between each group in intrinsic motivation were significant. But, the researchers did not measure actual performance in the balancing task, which would be interesting to see and compare to the results from this experiment. Also, it is important to realize that this positive and negative feedback was happening during the task of interest instead of beforehand. Despite this, the differences between groups in their main dependent variable – intrinsic motivation – varied in the same way that intrinsic motivation in this study varied (although the differences were non-significant in this study). Also, the differences they found in intrinsic motivation varied in the same way goal attainment differed for planks in this study.

An obvious difference from these past studies described in comparison to this study is the variable of feedback. Of course, acknowledgment of goals *before* the task of interest is different from verbal feedback *during* the task of interest. From seeing similar results though in studies looking at feedback during the task of interest, it seems as if acknowledgment of goals and feedback may work in similar ways. To study this, future research using our experimental paradigm could have separate conditions where the experimenter either provides positive acknowledgment of goals before the task of interest or provides positive feedback *during* the task of interest. The same could be done for no acknowledgment when it is possible and negative feedback. If similar results were found between acknowledgment and feedback, there would be further evidence that these two variables have similar effects on performance. Due to more research having been done of feedback rather than goal-acknowledgment, this finding could be very beneficial to further understanding of goal-acknowledgment.

More recent research may help to further understand this type of earlier feedback. Oettingen, Marquardt, and Gollwitzer (2012) showed that more positive feedback results in greater improvements in mental contrasting (a self-regulatory strategy) performance, even when this feedback occurs before the task of interest. The researchers in this study manipulated feedback of creative potential – they included a manipulation check that confirmed that those who received strong positive feedback (e.g., told they are in 90th percentile) believed they had better creative potential for the experimental tasks (creative insight tasks) than those who received moderate positive feedback (e.g., told they are in 60th percentile). Those who received the strongest positive feedback and were using mental contrasting in their creative tasks had significantly better performance than those who received less positive feedback and also used mental contrasting. These results are especially noteworthy because this manipulation of feedback

occurred *before* undergoing the task of interest – which is similar to the manipulation of acknowledgment *before* undergoing the exercise tasks in this experiment.

Lastly, this experiment ended with important similarities to Ariely, Kamenica, and Prelec's (2008) work in behavioral economics. In both this study and their study, acknowledgment, or lack of acknowledgment when it is possible, caused significant differences across conditions in the behavior of interest relative to both experiments. Further, since the behavior in this study was different than that in Ariely et al.'s (2008) research, there is now more evidence that the acknowledgment paradigm is pervasive across different situations and contexts.

There were other strengths of this research as well. The true experimental design allows for causal conclusions that correlational research would not be able to make. This creates a good springboard for other studies that are looking at similar effects. Could this detrimental effect of lack of acknowledgment extend to other behaviors? How pervasive could this effect be? Does this effect accentuate with multiple "rejections" of acknowledgment over a long period of time? How much does it matter who the person is that is or is not acknowledging the goals?

Another strength of this research is that it focuses on a section of goal-related behavior that is understudied: and that is what happens "after" one makes a goal. There is substantial research on how to make a goal with a lack of understanding regarding what one should do after they set the goal. Due to this lack of understanding, further research in this area has the potential to drastically improve goal attainment. This study can serve as a starting point for experimental research investigating what one should do after setting a goal.

There were some limitations with this research as well that are important to address. The participants in this experiment were fairly homogeneous – nearly three-fourths of participants were Caucasian, with almost all participants between the ages of 18 and 22. In addition, the

majority of participants were of healthy weight. This was likely due to the recruitment description of the experiment: participants were aware that they would be exercising, so only those who were comfortable with this would likely sign up. Having a homogeneous sample has its setbacks. It would be inappropriate to extrapolate these results to a general adult population due to the sample's narrow demographic diversity, and more research would need to be done on a more diverse population if conclusions could be made that this effect of acknowledgment is widespread.

Additionally, the setting where this experiment took place could also be seen as not very naturalistic since it was in a laboratory and not in a gym, athletic field, or other facility designated for physical exercise – although having someone else watch (such as the experimenter is this paradigm) could be likened to an exercise session in a gym where others are nearby. Additionally, the paradigm conducted in this experiment could be seen as very similar to an exerciser working with a personal trainer. It could also be argued that the experimental realism in this study was high, meaning that the participants were highly engaged in the task they were assigned to (exercising). Overall, intrinsic motivation scores across all conditions were very high. The intrinsic motivation scale was framed to have the participant reflect directly on the exercise session they had *just* engaged in (meaning that they were reflecting on the experiment), including questions asking about the enjoyment of the activity and also how much the activity held their attention. Seven questions were asked regarding intrinsic motivation, with each question on a seven point Likert scale. In each condition the average response was at a level of five out of seven or above (after reverse scoring appropriate questions).

Another possible limitation of this research is that the experimenter was not a close peer to the participant, and they were also not an actual personal trainer. This limits how much the results from this study can be directly applied to the real world, but it is also very possible that the effect

of acknowledgment could be *strengthened* if the person receiving the goals was either a trusted peer or an actual personal trainer – this could be due to the close peer who is receiving the goals possibly being someone the exerciser deeply respects and cares about (therefore taking seriously their opinion or the way they react to their goals), or simply a personal trainer being an individual with expertise, and therefore their opinion or reaction to physical activity goals would likely be taken seriously. In these cases it is plausible to think that these important others acknowledging goals would mean *more* to the goal-setter than an experimenter acknowledging goals, and important others *not* acknowledging goals could be more detrimental as well.

Finally, another limitation of this research is its short-term nature. The effects that were found from acknowledgment, or the lack of acknowledgment, were only a few minutes removed from the manipulation in this experiment. But, it is important to consider that this short-term effect is all that was hoped to be found in *this* experiment, but now that it has been shown that this effect can occur within physical-activity goals, there is merit to study this effect further. Future studies would be wise to see if this effect could have a long-term impact – possibly from repeated positive acknowledgments or repeated lack of acknowledgments when acknowledgment is possible. Finding a long-term effect would only strengthen the argument that acknowledgment of exercise goals has the potential to play a large role in goal attainment and exercise performance.

Conclusion

Regular physical activity has been shown to have substantial physical and mental benefits, ranging from a protection against obesity to a greater quality of life (Harvard School of Public Health, 2014; Faulkner & Taylor, 2005). Yet, a low percentage of people in the United States meet recommended levels of physical activity (Troiano et al., 2008). Additionally, goal setting has been shown to be an effective way to improve behavior (Locke & Latham, 1990; Latham &

Budworth, 2006), but clearly has room to be more effective for exercise with low rates of overall physical activity. While an abundance of research exists that investigates how one should set a goal, there is a lack of research, especially in physical activity, concerning what one should do with that goal after setting it. The research described throughout this paper addresses that limitation using an experimental paradigm of goal-acknowledgment. From the results of this experiment, the role of goal-acknowledgment has been shown to have an effect on exercise performance and has merit to be studied further in different contexts. A deeper understanding of goal-acknowledgment has the potential to form a clearer picture of what one should do after setting a physical activity-goal, possibly leading to higher levels of goal attainment and exercise performance.

References

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior.* Springer Berlin Heidelberg. 11-39.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Ariely, D., Kamenica, E., & Prelec, D. (2008). Man's search for meaning: The case of Legos. *Journal of Economic Behavior & Organization (67),* 671-677.

Baranowski, T. (1988). Validity and reliability of self report measures of physical activity: an information-processing perspective. *Research Quarterly for Exercise and Sport, 59*(4), 314-327.

Borg, G. (1977). *Physical work and effort.* Oxford: Pergamon Press.

Borg, G. (1998). *Borg's perceived exertion and pain scales.* Champaign, IL, US: Human Kinetics.

Borg, G. & Ohlsson, M. (1975). A study of two variants of a simple run-test for determining physical working capacity. *Reports from the Institute of Applied Psychology (61).*

Borg, G. & Ottoson, D. (1986). The perception of exertion in physical work. London: Macmillan.

Bouchard, C., Blair, S.N., & Haskell, W.L.E. (2007). *Physical activity and health.* Champaign, IL: Human Kinetics.

Caspersen, C.J., Powell, K.E., & Christenson, G.M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126-131.

Ceci, R., & Hassmen, P. (1991). Self-monitored exercise at three different RPE-intensities in treadmill versus field running. *Medicine and Science in Sports and Exercise, 23,* 732-

738.

Centers for Disease Control and Prevention. (2013). The health effects of overweight and obesity. Retrieved from http://www.cdc.gov/healthyweight/effects/index.html?s_cid=tw_ob245

Cohen, S. & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310-357.

Danaei, G., Ding, E.L., Mozaffarian, D., Taylor, B., Rehm, J., Murray, C.J.L., & Ezzati, M. (2009). The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. *PLos Medicine 6*(4):e100058

Downey, G. & Feldman, S.I. (1996). Implications of Rejection Sensitivity for Intimate Relationships. *Journal of Personality and Social Psychology, 70*(6), 1327-1343.

Durstine, J.L., Gordon, B., Wang, Z., & Luo, X. (2013). Chronic disease and the link to physical activity. *Journal of Sport and Health Science, 2*(1), 3-11.

Eheman, C., Henley, S.J., Ballard-Barbash, R., Jacobs, E.J., Schymura, M.J., Noone, A.M, Pan, L., Anderson, R.N., Fulton, J.E., Kohler, B.A., Jemal, A., Ward, E., Plescia, M., Ries, L.A.G., & Edwards, B.K. (2012). Annual report to the nation on the status of cancer. *Cancer, 118*(9), 2338-2366.

Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior research methods, instruments, & computers, 28*(1), 1-11.

Eston, R.G. & Williams, J.G. (1998). Reliability of ratings of perceived effort for regulation of exercise intensity. *British Journal of Sports Medicine, 22*, 153-154.

Faulker, G.E.J. & Taylor, A.H. (2005). *Exercise, health and mental health: Emerging relationships.* New York: Routledge.

Garrow, J.S. & Webster, J. (1985). Quetelet's index (W/H2) as a measure of fatness. *International Journal of Obesity, 9*(2), 147-153.

Greaves, C.J., Sheppard, K.E., Abraham, C., Hardeman, W., Roden, M., Evans, P.H., & Schwarz, P. (2011). Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC Public Health,* 11:119.

Hagger, M.S., Chatzisarantis, N.L.D., & Biddle, S.J.H. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology, 24*(1), 3-32.

Harvard School of Public Health. (2014). Obesity Prevention Source. Retrieved from http://www .hsph.harvard.edu/obesity-prevetion-source/obesity-causes/physical-activity-and-obesity

Hordern, M.D., Dunstan, D.W., Prins, J.B., Baker, M.K., Fiatarone Singh, M.A., & Coombes, J.S. (2012). Exercise prescription for patients with type 2 diabetes and pre-diabetes. *Journal of Science and Medicine in Sport, 15*(1), 25-31.

Katzmarkzyk, P.T., Gledhill, N., & Shephard, R.J. (2000). The economic burden of physical inactivity in Canada. *Canadian Medical Association Journal, 163*(11), 1435-1440.

Kim, H.-Y. (2013). Statistical notes for clinical researchers: assessing normal distribution using skewness and kurtosis. *Restorative Dentistry & Endodontics*, *38*(1), 52–54.

Kramer, A.F., Erickson, K.I., & Colcombe, J. (2006). Exercise, cognition, and the aging brain. *Journal of Applied Physiology, 101,* 1237-1242.

Lamb, K.L. (1995). Children's ratings of effort during cycle ergometry: An examination of two effort scales. *Pediatric Exercise Science, 7*(4), 407-421.

Latham, G.P. & Budworth, M. (2006). The effect of training in verbal self-guidance on the self-efficacy and performance of Native North Americans in the selection interview. *Journal of Vocational Behavior, 68*(3), 516-523.

Locke, E.A. & Latham, G.P. (1990). A theory of goal setting and task performance. Englewood Cliffs, NJ: Prentice-Hall.

Locke, E.A. & Latham, G.P. (2013). New developments in goal setting and task performance. Routledge.

Martin, S.B., Morrow, J.R., Jackson, A.W., & Dunn, A.L. (2000). Variables related to meeting the ACSM/CDC physical activity guidelines. *Medicine & Science in Sports & Exercise, 32*, 2087-2092.

McAuley, E., Duncan, T., & Tammen, V.V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 60,* 48-58.

McDonnel, M.N., Hillier, S.L., Roth, D.L., Judd, S.E., Haley, W.E, Esterman, A.J., & Howard, V.J. (2015). Abstract W P176: Self-reported pre-stroke physical activity levels influence functional ability following incident stroke. *Stroke, 46*(Supp. 1), 176.

Mei, Z., Grummer-Strawn, L.M., Pietrobelli, A., Goulding, A., Goran, M.I., & Dietz, W.H. (2002). Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents. *American Journal of Clinical Nutrition, 75*(6), 978-985.

Mokdad, A.H., Marks, J.S., Stroup, D.F., & Gerberding, J.L. (2004). Actual causes of death in the United States, 2000. *The Journal of the American Medical Association, 291*(10), 1238-1245.

Murcia, J., San Roman, M., Galindo, C., Alonso, N., & Gonzalez-Cutre, D. (2008). Peers' Influence on Exercise Enjoyment: A Self-Determination Theory Approach. *Journal of Sports Science & Medicine, 7*(1), 23-31.

National Center for Chronic Disease Prevention and Health Promotion. (2005). *Behavioral Risk Factor Surveillance System.*

Oettingen, G., Marquardt, M.K., & Gollwitzer, P.M. (2012). Mental contrasting turns positive feedback on creative potential into successful performance. *Journal of Experimental Social Psychology, 48*(5), 990-996.

Ogden, C.L., Carroll, M.D., Kit, B.K., & Flegal, K.M. (2014). Prevalence of childhood and adult obesity in the United States, 2011–2012. *Journal of the American Medical Association (JAMA), 311*(8), 806-814.

Pate, R.R., Pratt, M., Blair, S.N., Haskell, W.L., Macera, C.A., Bouchard, C.,… Wilmore, J.A. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association, 273,* 402-407.

Physical Activity Guidelines Advisory Committee. (2008). *Physical Activity Guidelines Advisory Committee Report, 2008.* Washington, DC: U.S. Department of Health and Human Services.

Rodgers, W.M. & Brawley, L.R. (1991). The role of outcome expectations in participation motivation. *Journal of Sport and Exercise Psychology, 13,* 411-427.

Ryan, R.M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43,* 450-461.

Ryan, R.M. & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic

motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.

Sallis, J.F., Grossman, R.M., Pinski, R.B., Patterson, T.L., & Nader, P.R. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine, 16,* 825-836.

Sallis, J.F., Pinski, R.B., Grossman, R.M., Patterson, T.L., & Nader, P.R. (1988). The development of self-efficacy scales for health-related diet and exercise behaviors. *Health Education Research, 3,* 283-292.

Sattelmair, J., Pertman, J., Ding, E.L., Kohl III, H.W., Haskell, W., Lee, I. (2011). Dose response between physical activity and risk of Coronary Heart Disease. *Circulation, 124,* 789-795.

Seligman, M.E.P. & Csikszentmihalyi, M. (2000). Positive psychology: an introduction. *American Psychologist, 55,* 5-14.

Shilts, M.K., Horowitz, M., & Townsend, M. (2004). Goal setting as a strategy for dietary and physical activity behavior change: a review. *American Journal of Health Promotion, 19*(2), 81-93.

Swezey, R.W., Meltzer, A.L., & Salas, E. (1994). Some issues involved in motivating teams. *Motivation: Theory and Research,* 141-169.

Tabachnick, B.G., & Fidell, L.S. (2007). *Experimental designs using ANOVA*. Thomson/Brooks/Cole.

Thorp, A.A., Owen, N., Neuhaus, M., & Dunstan, D.W. (2011). Sedentary behaviors and subsequent health outcomes in adults. *American Journal of Preventive Medicine, 41*(2), 207-215.

Todd, C. & O'Connor, J. (2005). Clinical Supervision. In N. Skinner, A.M. Roche, J. O'Connor, Y. Pollard, & C. Todd (Eds.), *Workforce Development TIPS (Theory Into Practice*

Strategies): A Resource Kit for the Alcohol and Other Drugs Field. National Centre for Education and Training on Addiction (NCETA), Flinders University, Adelaide, Australia.

Troiano, R.P., Berrigan, D., Dodd, K.W., Masse, L.C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports & Exercise, 40*(1), 181-188.

Tsigilis, N. & Theodosiou, A. (2003). Temporal stability of the Intrinsic Motivation Inventory. *Perception and Motor Skills, 97*, 271-280.

Vallerand, R.J. & Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: a test of cognitive evaluation theory. *Journal of Sport Psychology*, *6*, 94-102.

Wang, G., Pratt, M., Macera, C.A., Zheng, Z., & Heath, G. (2004). Physical activity, cardiovascular disease, and medical expenditures in U.S. adults. *Annals of Behavioral Medicine*, *28*(2), 88-94.

Warnecke, R.B., Johnson, T.P., Chavez, N., Sudman, S., O'Rourke, D.P., Lacey, L., & Horm, J. (1997). Improving question wording in surveys of culturally diverse populations. *Annals of epidemiology*, *7*(5), 334-342.

Appendix A

Goals

I want to do _____ repetitions of pushups doing variation # _____.

Variation 1: On knees using table

Variation 2: On knees without using table

Variation 3: Standard pushup

I want to hold a plank exercise for _____ seconds doing variation # _____.

Variation 1: On knees and forearms

Variation 2: On toes with arms fully extended (like the start of a pushup)

Variation 3: Standard plank on toes and forearms

I want to do _____ jumping jacks *in one minute*.

I want to balance on one foot with my eyes closed for _____ seconds.

Appendix B

Borg's Ratings of Perceived Exertion (RPE) Scale

"While exercising we want you to rate your perception of exertion, i.e., how heavy and strenuous the exercise feels to you. The perception of exertion depends mainly on the strain and fatigue in your muscles and on your feeling of breathlessness or aches in the chest. Look at this rating scale; we want you to use this scale from 6 to 20, where 6 means 'no exertion at all' and 20 means 'maximal exertion.' Try to appraise your feeling of exertion as honestly as possible, without thinking about what the actual physical load is. Don't underestimate it, but don't overestimate it either. It's your own feeling of effort and exertion that's important, not how it compares to other people's. What other people think is not important either. Look at the scale and the expressions and then give a number. Any Questions?"

6	No exertion at all
7	
8	Extremely light
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

Appendix C

Subset of Intrinsic Motivation Inventory (IMI) that Measures Intrinsic Motivation Post-Experimentally

"For each of the following statements, please indicate how true it is for you, using the following scale:

1 2 3 4 5 6 7

Not at all true Somewhat true Very true"

1. I enjoyed doing this activity very much
2. This activity was fun to do
3. I thought this was a boring activity
4. This activity did not hold my attention at all
5. I would describe this activity as very interesting
6. I thought this activity was quite enjoyable
7. While I was doing this activity, I was thinking about how much I enjoyed it

Appendix D

Rejection Sensitivity

"Each of the items below describes things college students sometimes ask of other people. Please imagine that you are in each situation. You will be asked to answer the following questions:

1) How concerned or anxious would you be about how the other person would respond?

1 2 3 4 5 6

Very unconcerned Very concerned

2) How do you think the other person would be likely to respond?

1 2 3 4 5 6

Very unlikely Very likely"

1. You ask your parents for help in deciding what programs to apply to.

How concerned or anxious would you be over whether or not your parents would want to help you?

I would expect that they would want to help me.

2. You approach a close friend to talk after doing or saying something that seriously upset him/her.

How concerned or anxious would you be over whether or not your friend would want to talk with you?

I would expect that he/she would want to talk with me to try to work things out.

3. After graduation, you can't find a job and ask your parents if you can live at home for a while.

How concerned or anxious would you be over whether or not your parents would want you to come home?

I would expect I would be welcome at home.

4. You call your boyfriend/girlfriend after a bitter argument and tell him/her you want to see him/her.

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would want to see you?

I would expect that he/she would want to see me.

5. You ask your parents to come to an occasion important to you.

How concerned or anxious would you be over whether or not your parents would want to come?

I would expect that my parents would want to come.

6. You ask a friend to do you a big favor.

How concerned or anxious would you be over whether or not your friend would do this favor?

I would expect that he/she would willingly do this favor for me.

7. You ask your boyfriend/girlfriend if he/she really loves you.

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would say yes?

I would expect that he/she would answer yes sincerely.

8. You go to a party and notice someone on the other side of the room and then you ask them to dance.

How concerned or anxious would you be over whether or not the person would want to dance with you?

I would expect that he/she would want to dance with me.

Appendix E

Exercise-Specific Self-Efficacy

"Below is a list of things people might do while trying to increase or continue regular exercise. We are interested in exercises like running, swimming, brisk walking, bicycle riding, or aerobics classes. Whether you exercise or not, please rate how confident you are that you could really motivate yourself to do things like these consistently, for at least six months. Please circle one number for each question. How sure are you that you can do these things?:

1	2	3	4	5
I know I cannot		Maybe I can		I know I can"

1. Get up early, even on weekends, to exercise.
2. Stick to your exercise program after a long, tiring day at work.
3. Exercise even though you are feeling depressed.
4. Set aside time for a physical activity program; that is, walking, jogging, swimming, biking, or other continuous activities for at least 30 minutes, 3 times per week.
5. Continue to exercise with others even though they seem too fast or too slow for you.
6. Stick to your exercise program when undergoing a stressful life change (e.g. divorce, death in the family, moving).
7. Attend a party only after exercising.
8. Stick to your exercise program when your family is demanding more time from you.
9. Stick to your exercise program when you have household chores to attend to.
10. Stick to your exercise program even when you have excessive demands at work.
11. Stick to your exercise program when social obligations are very time consuming.
12. Read or study less in order to exercise more.

Appendix F

Exercise-Specific Social Support

"Below is a list of things people might do or say to someone who is trying to exercise regularly. If you are not trying to exercise, then some of the questions may not apply to you, but please read and give an answer to every question. Please rate each question *twice*. Under *family*, rate how often anyone living in your household has said or done what is described during the last three months. Under *friends*, rate how often your friends, acquaintances, or coworkers have said or done what is described during the last three months. Please write one number from the following rating scale in each space:

1	2	3	4	5
None	Rarely	A few times	Often	Very often

During the past three months, my family (or members of my household) or friends:"

1. Exercised with me.
2. Offered to exercise with me.
3. Gave me helpful reminders to exercise ("Are you going to exercise tonight?").
4. Gave me encouragement to stick with my exercise program.
5. Changed their schedule so we could exercise together.
6. Discussed exercise with me.
7. Complained about the time I spend exercised.
8. Criticized me or made fun of me for exercising.
9. Gave me rewards for exercising (bought me something or gave me something I like).
10. Planned for exercise on recreational outings.
11. Helped plan activities around my exercise.
12. Asked me for ideas on how *they* can get more exercise.
13. Talked about how much they like to exercise

Appendix G

Table 1

Demographics summary by condition. Condition 1 = private goals. Condition 2 = goals acknowledged. Condition 3 = goals not acknowledged.

	Condition 1	Condition 2	Condition 3
Females			
Mean age	19.6	20.0	19.3
Mean BMI	23.0	23.3	23.0
Males			
Mean age	20.1	19.5	20.0
Mean BMI	24.9	23.7	23.8

Table 2

Results summary for goal averages, performance averages, and goal attainment percentages. Pushups and jumping jacks are represented in repetitions while planks and balancing are represented in seconds.

	Pushup	Planks	Jumping Jacks	Balancing
Goal Averages				
Private goals	27.6	69.7	48.7	40.2
Goals acknowledged	26.1	68.1	52.1	36.6
Goals not acknowledged	28.2	65.9	50.7	30.4
Performance Averages				
Private goals	29.5	79.0[b]	65.9	36.3
Goals acknowledged	27.9	88.2[a]	68.2	31.9
Goals not acknowledged	30.2	73.4[b]	66.7	35.0
Goal Attainment %				
Private goals	90.7%[a]	76.2%[a,b]	86.7%	44.4
Goals acknowledged	89.8%[a]	87.5%[a]	87.5%	40.4
Goals not acknowledged	73.0%[b]	66.0%[b]	87.5%	43.8

Note: within column values with different superscripts are significantly different at $p<0.05$

Table 3

Correlation matrix. SS = Physical activity-specific social support. RS = Rejection sensitivity. SE = Physical activity-specific self-efficacy. IM = Intrinsic motivation for the experimental exercise session. E = Exertion. JJs = Jumping jacks.

	SS	RS	SE	IM	E	Pushups	Planks	JJs
SS	----							
RS	.02	----						
SE	.27**	.21*	----					
IM	.13	.01	.22**	----				
E	.06	.01	.03	.19*	----			
Pushups	.18*	.03	.25**	.10	.14	----		
Planks	.09	.08	.31***	.28**	.26**	.42***	----	
JJs	.18*	.06	.13	.44***	.16	.26**	.34***	----
Balancing	.24**	.11	.05	.15	.06	.19*	.30***	.09

Note: * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Appendix H

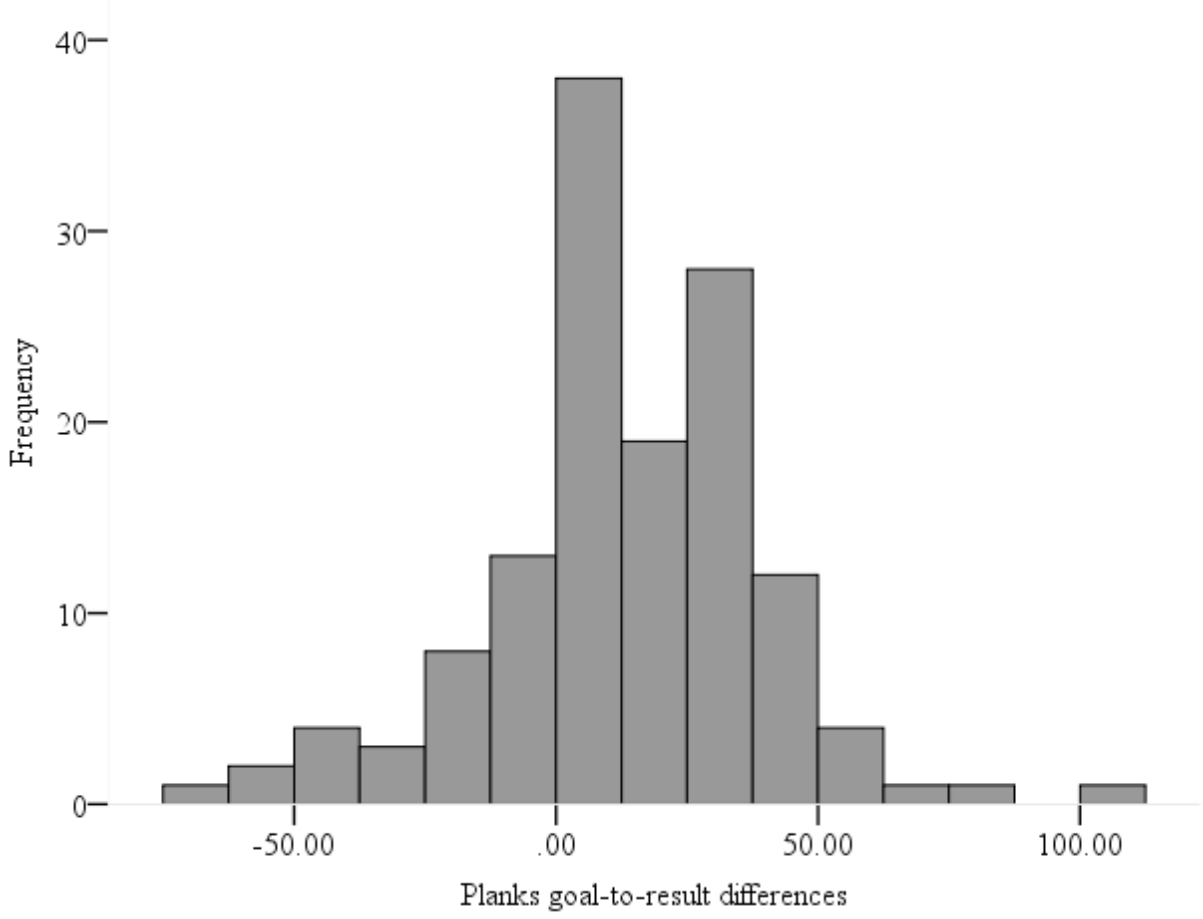

Figure 1. Plank scores

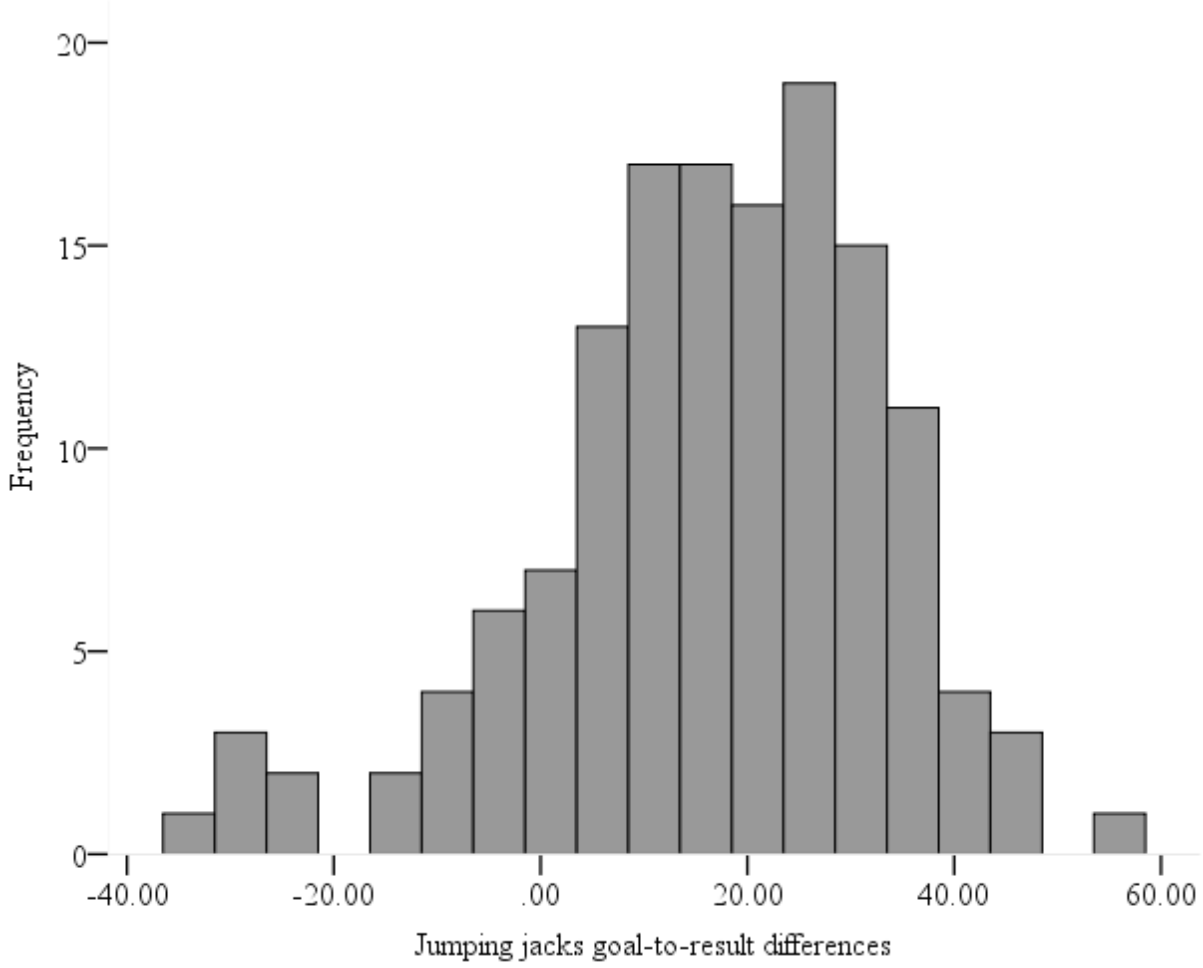

Figure 2. Jumping jack scores