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TRULY ACCOMPLISHED:

AN EXPLORATORY STUDY OF MOTIVATION AND SOCIAL INFLUENCE

by

CARLY GENEVIEVE TUCKER

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Psychology
in the College of Sciences
in The Burnett Honors College
at the University of Central Florida
Orlando, Florida

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Thesis Chair: Dr. Barbara Fritzsche

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ABSTRACT

The purpose of this study was to examine the motivation of individuals to use Truly Accomplished (TA) as a fitness intervention, with or without a social support component. All participants utilized the TA Software as a fitness intervention and received weekly feedback on their progress. Thirty participants were randomly assigned to either participate in the regular TA process ($n=16$) or a modified TA process ($n=14$) with the addition of a social support component in the form of a social media group. Participants in the modified condition posted weekly to a Facebook group page about successes and obstacles they faced and gave feedback to their peers. It was hypothesized that participants, regardless of condition, would show fitness gains in the 6-week study. Also, with the added social support component to TA, participants were expected to have higher levels of self-determination in relation to the three psychological needs (i.e. autonomy, relatedness, and competence) and higher levels of perceived social support. A between-subjects design was used to measure overall effectiveness, changes in fitness performance (plank, push-ups, wall-sit, step-test) and body composition (BMI, percent body fat), perceived social support, levels of psychological needs satisfaction as it relates to the three basic needs (autonomy, competence, and relatedness), and satisfaction with TA. No significant differences were found between conditions for satisfaction with TA, levels of perceived social support, or levels of psychological needs satisfaction post-intervention. However, a significant increase was found regardless of condition in terms of autonomy and guidance. A significant increase was shown in both the plank and modified push-up post-intervention measure, regardless of condition. Finally, the condition with the added social support had a significantly higher overall effectiveness gain than the condition with no added social support. The practical and theoretical implications of the results are discussed.

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INTRODUCTION

Engaging in regular physical activity has a multitude of health benefits including reduced likelihood of coronary heart disease, adult onset diabetes, obesity, cancer, and metabolic syndrome (Bouchard, Blair, & Haskell, 2007; Gilmour 2007). A growing body of research also suggests a variety of psychological health factors are dependent on the adoption or maintenance of a physically active lifestyle (Fox, 2002). For example, emerging research has shown that variations in cognitive functioning in older adults are partially attributed to an active lifestyle (Colcombe, Erickson, Raz, Webb, Cohen, and McAuley, 2003). Psychological benefits as a result of regular physical activity include enhanced self-esteem, vitality, and satisfaction with life (Fox, Stathi, McKenna, & Davis, 2006) and reductions of mental illnesses such as depression, anxiety, and chronic stress (Acevedo & Ekkekakis, 2006).

Given all of the research supporting the value of regular activity in combating disease, it seems bewildering that health reports often reveal insufficient participation in regular physical activity, particularly in adults. Recent data derived from the Canadian Community Health survey indicate that 47.8% of Canadians 12 years or older are inactive during their leisure time (Gilmour, 2007). This trend highlighting sedentary behavior is not unique to just Canada (Bouchard et al., 2007). Current research indicates nearly 24.2% of college students participate in no moderate activity a day and 41.4% participate in no vigorous activity (Egli et al., 2011). Experts now identify physical inactivity as a key component of the obesity epidemic (Katzmarzyk & Janssen, 2004). Multiple theories, such as the self-determination theory, have tried to identify why people initiate, continue, and terminate their involvement in physical activity (Hagger & Chatzisarantis, 2007). Although there are many factors that explain why a

person terminates regular physical activity, an individual's motivation to continue is a key component.

The Naylor-Pritchard-Ilgen (NPI) theory of motivation (Naylor, Pritchard, & Ilgen, 1980) and the recent expansion of the theory by Pritchard and Ashwood (2008) serve as the theoretical basis for Truly Accomplished (TA), an empirically supported evidence-based intervention process designed to produce behavior change. TA allows individuals to identify how they want to feel about their lives and assists them in making the desired changes (Dixon, 2012; Pritchard & Ashwood, 2012). Behavior change is accomplished in a series of steps that personalize a measurement and feedback system for each user, which aligns an individual's values, goals, and behaviors. As a result, this increases motivation and allows for maximizing life satisfaction (Dixon, 2012).

The method and process of TA is derived from the Productivity Measurement and Enhancement System (ProMES), an intervention system used to improve workplace productivity in work units and overall employee performance. ProMES is designed to improve motivation, resulting in an increase in productivity and performance. The system is designed to improve productivity of work units within organizations by reducing sources of uncontrolled variation in performance as well as providing feedback based on the controlled measures (Pritchard, Weaver, & Ashwood, 2010). ProMES also stresses the importance of participation in the process because it leads to greater acceptance and understanding of the measures and increases an individual's accountability for their performance. ProMES yields large productivity increases across various jobs, different organizations, and multiple countries, with long lasting effects over time (Pritchard, Harrell, DiazGranados, & Guzman, 2008). A meta-analysis compiling 20 years of

transnationally collected data in 83 field studies was conducted using the ProMES intervention. It found that ProMES is an effective intervention system to increase productivity, with a mean effect size of 1.16, yielding large productivity increases that lasted over extended periods of time (Pritchard et al., 2008).

The key difference between ProMES and TA is the aim of the intervention system. ProMES is directed toward group productivity and company goals; whereas Truly Accomplished is an intervention system focused on productivity and development of the individual, and is designed to assist individuals looking to make a lifestyle change.

In 2013, Chaffee examined the effectiveness of TA as a lifestyle intervention in the context of fitness. Chaffee's (2013) findings suggest that motivation to use TA as a fitness intervention was generally high for participants and they were satisfied overall with the use of the system. The study tested TA as an individualized intervention, with no peer support given other than weekly feedback meetings with a facilitator. There is a large body of research supporting the idea that a positive social influence can result in higher motivation levels to initiate and sustain exercise.

Research grounded in the self-determination theory has shown the positive influence that social support can have on facilitating behavior change toward a healthier, active lifestyle (Williams, Gagne, Ryan, & Deci, 2002). Research on self-determination theory and social support as motivation has highlighted the importance of autonomy support offered by exercise instructors while individuals participate in exercise classes (Edmunds, Ntoumanis, & Duda, 2008; Wilson & Rodgers, 2004). Research has also shown that exercise-specific social support may provide the initial motivation to increase physical activity (Eyler, Brownson, Donatelle, et

al., 1999). Social support in previous studies has been summarized in a multitude of ways. For example, Eyster, Brownson, and Donatelle et al. (1999) explained social support in four different dimensions when pertaining to exercise: instrumental (e.g. giving a non-driver a ride to an exercise class); informational (e.g. telling a coworker about a community exercise program); emotional (e.g. calling a friend to see how their new exercise program is progressing); or appraisal (e.g. providing encouragement or reinforcement for learning a new activity or skill). However, Wilson and Rodgers (2004) and Edmunds, Ntoumanis, and Duda (2008) further explained social support in relation to one's psychological needs. That is, social support is related to a person's autonomy (i.e. need for personal control over behaviors), relatedness (i.e. the need to belong) and competence (i.e. need to be capable to obtain a desired outcome) (Edmunds, Ntoumanis, & Duda, 2008; Wilson & Rodgers, 2004).

The purpose of this study was to examine the motivation of individuals to use TA as a fitness intervention as well as their satisfaction using the feedback system. This study also examined individuals' self-determination in relation to exercise as well as the amount of social support that is perceived by each participant. Using a between-groups design, participants utilized the TA Software as a fitness intervention and received weekly feedback on their progress. Condition 1 participated in the regular TA process while Condition 2 participated in a modified TA process with the addition of a social support component in the form of a social media group to the weekly feedback. Participants in the modified condition were required to post to a Facebook group page about successes and obstacles they faced throughout the week with their measures as well as giving feedback to their peers on the group page. This addition to the

TA process operationalized social support from the participant's peers through relation of experiences using TA as a fitness intervention.

THEORETICAL AND EMPIRICAL FOUNDATIONS

Motivation Theory

The Naylor-Pritchard-Ilgen (NPI) theory of motivation (Naylor, Pritchard, & Ilgen, 1980), and the recent expansion of the theory by Pritchard and Ashwood (2008) provide the primary theoretical background for TA. The NPI theory defines motivation as “the process of allocating personal resources in the form of time and energy to various acts in such a way that the anticipated effect resulting from these acts is maximized” (Naylor, Pritchard, & Ilgen, 1980, p. 159). The expansion of the theory by Pritchard and Ashwood emphasizes that people are motivated by expectations and that an individual’s energy is allocated to maximize the satisfaction of the participant’s needs. It assumes the people have a certain amount of energy and people also have needs for things like food, achievement, and power (Pritchard, Weaver, & Ashwood, 2012). The theory is broken down into five components of motivation. First, efforts are applied to *actions*, or anything an individual does that generates *results*. Results are measurable outputs of the actions, which are then placed on a good-to-bad continuum to generate *evaluations*. Evaluations then lead to a given *outcome* generated by an evaluator. Outcomes can be intrinsic or extrinsic and get their motivation from the ties with *Needs Satisfaction*. When outcomes satisfy an individual’s needs, motivation is generated. The strength of the connection between these five components vastly influences an individual’s motivation. In other words, according to the NPI theory, an individual’s motivation is high when actions generate desired results and satisfies the participant’s needs.

Actions-to-Results Connections

An action is anything that requires time and effort and produces a measurable output, or results. Results must be specific, controllable, and tangible (Pritchard & Ashwood, 2008). In

order to maximize the Actions-to-Results to connection, a person must be able to complete the action necessary to produce the desired results. This connection as part of the Pritchard and Ashwood theory of motivation (2008) is the relationship between the amount of energy a person generates toward an action and the amount of results that are in turn produced. In order for a strong connection, an individual must be confident in completing the action, know the amount of effort that is required for desired results, and have control over the action (Pritchard, Weaver, & Ashwood, 2012).

This connection is addressed in TA by the development of the measurement system, which is designed by the participant as well as a TA facilitator for guidance. All decisions ensure that the development of the system is under the TA user's control, resulting in maximization of an individual's motivation (Pritchard & Ashwood, 2012).

Results-to-Evaluation Connection

The Results-to-Evaluation connection must also be strong in order for motivation to be maximized, according to the Pritchard-Ashwood (2008) theory of motivation. This connection is the relationship between the amount of results that are produced and the effectiveness of those results. An important aspect of this connection is that evaluations are perceived as valid, given in a timely manner, and that any change in the amount of results is reflected by the changes of the level of evaluation (positive or negative). In order for this connection to be strong, the individual must have a clear understanding of the importance of achieving different results and be able to prioritize for improvement. In other words, the individual must be able to prioritize between areas of improvement in their lives as well as be able to clearly understand the expected levels of

each result, and whether the results fall above or below expectation (Pritchard & Ashwood, 2012).

In TA the results-to-evaluation connection is operationalized through Success Maps, which are visual representations of the connections between the results an individual produces and the effectiveness scores that corresponds with the results. These graphical representations are an important part of the TA process and will be discussed later in detail.

Evaluations-to-Outcome Connection

The Evaluations-to-Outcome connection from the Pritchard-Ashwood (2008) theory of motivation is the perceived relationship between how favorable the evaluations are and the expected amount of resulting outcomes. Outcomes are rewards or punishments and can be extrinsic or intrinsic. Noticeable variations in the positive and negative evaluations are crucial for maximizing motivation in order for increases in outcomes. In TA, outcomes can be increased both directly, through results of a given objective, or indirectly, by fulfilling the desired feelings of an individual. Individuals are motivated by, for example, seeing benefits of increasing cardiovascular activity; as well feedback received from improved effectiveness scores. Finally, it is important that the relationship between intrinsic and extrinsic outcomes received is clear and consistent over time. The link between performance and outcomes must be defined for a strong Evaluation-to-Outcomes connection (Pritchard & Ashwood, 2012).

Outcomes-to-Needs Connection

The final connection of the Pritchard-Ashwood (2008) theory of motivation is the Outcomes-to-Needs Satisfaction. This connection is the relationship between the outcome level of an individual and the anticipated need satisfaction level. In other words, it is the outcomes a person receives that actually satisfy important needs. In the TA system, positive outcomes produce higher levels of satisfaction, but negative outcomes produce higher levels of dissatisfaction. For a strong connection, it is crucial that outcomes actually satisfy the fundamental needs of the individual.

As already noted, TA allows for both intrinsic and extrinsic outcomes. The majority of individuals experience need satisfaction from intrinsic outcomes, but because of TA's individualized nature, extrinsic outcomes that are received will satisfy needs specific to an individual's system. Finally, it is crucial that a person has accurate expectations about how satisfying a particular outcome will be. For example, if a person's expectations do not align with the actual level of needed satisfaction, the resulting motivation will be low (Pritchard & Ashwood, 2012).

Participation and Process of TA

The NPI and Pritchard-Ashwood theories emphasize the importance of participation throughout the system development process. Participation in system development promotes acceptance, ownership, understanding, and perceived validity of the system (Naylor, Pritchard, & Ilgen, 1980; Pritchard & Ashwood, 2008). TA is developed in a series of steps, each designed to allow for participation, in turn enforcing the theoretical motivation factors discussed previously.

Defining Values (To Feel List)

At the beginning of system development, participants are led through decision-making exercises to create a To Feel List, which allows them to identify the feelings or emotions they are looking to fulfill in their lives (e.g., accomplished, confident, connected). This is done to help the participants define what values are important in their lives and reinforce living in congruence with these values (Dixon, 2012). The To Feel List acts as the foundation for the entire system building process. Research on decision-making has found that participation increases perceptions of fairness, acceptance of decisions, and goal commitment (Bobko & Colella, 1994; Cawley, Keeping, & Levy, 1998; Kanfer, 1990; Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1989). After the exercises are completed, participants have a better understanding of the desired feelings they are looking to fulfill as well as a direction to start conceptualizing the actions they must take to live in accordance with these emotions.

Developing Objectives (Strategies)

Based on the feelings previously defined, participants are led through a process to develop strategies. Strategies are the areas in person's life that they desire to improve. The idea is that if the strategy is satisfied in a person's life, the desired feelings will be fulfilled. The selected strategies must be congruent with the previously defined values and that the set of strategies encompass the important factors of the individual's life, by being general enough to lead to the desired feelings but specific enough to know when the strategy has been achieved (Dixon, 2012).

Designing Indicators (Measures)

Participants are then led by a facilitator to develop valid measures for each strategy. Measures act as quantifiable reflections of the strategies previously defined and show how well each strategy is being achieved. For measures to be effective, they must completely fulfill the

corresponding strategy, they must maximize individual control, and there must be an efficient way to collect data on each measure (Pritchard & Ashwood, 2012). For example, an individual may want to become more confident. The strategy might be “Become more toned” so a measure may include “Number of 20-minute body-weight circuit workouts per week” or “Number of minutes spent lifting weights per week.” Wright, Pritchard, van Tuijl, Weaver, Bedwell, and Fullick (2010) states that it is important for individuals to participate in the development of performance indicators because it ensures higher acceptance and understanding of what they will be evaluated on, further increasing performance accountability.

Developing Contingencies (Success Maps)

Success Maps, also known as contingencies in ProMES, are graphical representations of the relationship between the amount of indicator being measured and the amount of a participant’s effectiveness that corresponds (Pritchard et al., 1989). Effectiveness scores are defined as “the amount of value created for that person by the level of performance on the indicator,” or the numerical values that range from negative numbers to positive numbers in the TA process (Dixon, 2012). Negative numbers indicate performance below expectation, whereas positive numbers reflect performance above the minimum expectation level. An effectiveness score of zero is the minimum expected level of performance of a measure (Dixon, 2012, p. 4-5).

Success Maps are important for the TA process for multiple reasons. First, they provide a chance to better understand the relative importance of each measure to the user. The greater the range in effectiveness scores between the minimum and maximum indicator levels, the greater importance of that measure. Success Maps capture non-linear relationships between results and evaluations of performance. As research has shown, the relationship between a

person's output and the value of the output is not usually linear (Pritchard et al., 1989). This can be reflected in the common shapes Success Maps form. A linear shaped contingency reflects an equal gain of effectiveness for each equal amount of an indicator, or a 1:1 ratio of effectiveness gain. A diminishing returns curve reflects a large effectiveness gain at the lower levels of indicator followed by a decrease in the upper levels of the contingency. A critical mass curve indicates very little gain in effectiveness until the participant reaches maximal levels in the contingency, where effectiveness scores then rise rapidly (Dixon, 2012).

Success Maps allow for individuals to understand the expectations of their performance, reflected through the zero point that indicates the minimum acceptable level of a given strategy. Lastly, these graphical representations allow for an overall effectiveness score for the user, which is calculated as the sum of the effectiveness scores for each indicator. This score can show the user where she stands overall. A score of zero indicates that the user is just at an acceptable level, whereas a positive score means that she is above the minimum expected level of performance (or vice-versa). The overall effectiveness score can be tracked over time to show if an individual is increasing or decreasing in performance throughout the TA process (Dixon, 2012).

Defining Maximum and Minimum Level:

The development of Success Maps is facilitator-led in a series of steps. The horizontal axis of a success map is the amount of the indicator assigned, ranging from the "worst" value assigned to the "best" feasible level assigned, and the vertical axis represents the effectiveness level, or the amount of contribution toward a given indicator (Pritchard, Weaver, & Ashwood 2012).

The scale of effectiveness scores range from -100 to +100, or the minimum to maximum effectiveness of a given indicator. Zero represents the minimum expected level of effectiveness, which acts as a neutral level for the participant. First, the participant defines the maximum and minimum values for each indicator. The maximum level can be defined as the best possible given amount of an indicator that could ever occur, if everything was ideal. The minimum effectiveness level is as low as a given indicator could ever realistically be (Dixon, 2012). Then the participant defines the minimum expected value, or the zero point on the effectiveness scale. This is the amount of effectiveness that is neither good nor bad, but is the minimum amount of a given indicator that is acceptable (Pritchard, Weaver, & Ashwood 2012).

Assigning Effectiveness Values:

The participant then ranks the importance of the maximum and minimum indicator levels that were previously assigned. To rank the maximum levels, the participant is asked to imagine if all the indicators were at the acceptable level, or zero, which indicator would be most beneficial to a person's effectiveness to increase to the maximum level. That indicator that is most important is assigned a rank of one. The process of ranking indicators is continued until all maximum indicators have been ranked. The participant then ranks the minimum levels, or if all indicators were at the acceptable levels, which would have the most detrimental effect if dropped the minimum level. This indicator is assigned a rank of one and the process is continued till all minimum levels are ranked (Dixon, 2012).

After the best and worst values are defined, the participant must identify the relationship that each indicator relates to the amount of effectiveness (Pritchard, Weaver, & Ashwood 2012). Effectiveness is based on the ranks given to each indicator. For instance, the indicator with a rank

of one automatically receives a maximum effectiveness score of +100 and a minimum effectiveness score of -100. The participant is then asked to assign effectiveness scores in comparison to rank one. How much less important is it? Is it close to rank one or about half as important? If the next measure is half as beneficial as rank one, it would receive an effectiveness score of +50; if the maximum of rank two is almost as important as rank one then it could receive an effectiveness score closer to +100. This process is continued till all ranks are assigned maximum effectiveness scores. The process is done again, but for the minimum effectiveness values. The measure that was assigned a minimum rank of one would automatically receive an effectiveness score of -100. All of the measures are then ranked again relative to this. By assigning effectiveness scores and ranking measures in relation to one another, it creates a common scale, allowing for an overall effectiveness score (Chaffee, 2013).

Developing the Contingency (Success Map):

The participant is then led through a process to graphically plot the points on the contingency. The minimum and maximum scores designed previously correspond as the highest and lowest effectiveness values on the contingency (Dixon, 2012). The minimum expected level for each indicator is plotted at zero. Once the maximum, minimum, and minimum expected values have been plotted corresponding to their effectiveness levels, the final points are then connected by interpreting the relationship between the three values of each indicator. A key point to note about the development of contingencies is that the effectiveness scores of a given contingency represent the relative importance of effectiveness of an indicator (Pritchard, Weaver, & Ashwood 2012).

After all Success Maps have been developed and reviewed, data collection can begin. Performance on each measure is recorded daily, which is then input into the Success Meter by the facilitator on a daily or weekly basis. After data has been submitted into the Success Meter, a feedback report is created. A feedback report gives both descriptive (the amount of each measure) and evaluative (the amount of effectiveness that corresponds) information on the individual's overall performance for that week. The feedback report also provides overall performance for each measure over weeks recorded, potential effectiveness loss and potential effectiveness gain through visual maps and graphs. The TA user continues to measure performance and review feedback reports on a daily or weekly basis (Chaffee, 2013; Dixon 2012; Pritchard & Ashwood, 2012).

Overall, the NPI (1980) theory and the expansion by Pritchard and Ashwood (2008) highlight the importance of strong connections between *action-to-results*, *results-to-evaluation*, *evaluation-to-outcome* and *outcome-to-need satisfaction* for a user's motivation to be maximized. These connections are influenced by system development, which in turn promote acceptance, understanding, ownership, and perceived validity of a system through a user's participation. Chaffee (2013) found that expert-developed systems, not created by the participant themselves, adversely affected the participant attitude toward the TA process. This suggests that creating one's personal Success Map may be an important step to result in strong connections described by the NPI (1980) theory of motivation (Chaffee, 2013).

Truly Accomplished Empirical Studies

Although there have been a multitude of studies on the effectiveness of ProMES, there are only two studies testing the effectiveness of TA. A study conducted in 2012 tested Truly

Accomplished as an intervention system by helping participants improve their behavior through personalized feedback systems. Dixon's (2012) study examined the outcomes of these behavior improvements when seen in positive spillover effects into the workplace.

Dixon's (2012) study employed a pre-post design, with one-group composed of a 44 participant sample size. Dixon herself served as the facilitator, guiding each participant through system development. Each participant completed their first session with a facilitator conducting the system development. The first session was followed by weekly data collection and four feedback sessions that were held every two weeks.

Dixon (2012) found that TA is an effective intervention for lifestyle change. Individuals' overall effectiveness scores increased a large amount from the baseline week to final completion, with a mean effect size of 2.93. This shows that TA's effect on behavior and attitude was significant (Dixon, 2012).

Overall, the TA process was well-received from participants and individuals feel they made important changes as a result of participating in the intervention. Some individuals recognized their behavior was highly associated with external demands rather than internal motivation, and generally considered the participation in the intervention an enlightening experience. Participants generally found that defining values was a beneficial part of the TA process, causing a new sense of motivation to arise and they also noted that developing personal contingencies and reviewing feedback reports acted as a more concrete piece of the process.

Results from Dixon's (2012) study support the effectiveness of Truly Accomplished as a lifestyle improvement system. TA allows for the transformation of undefined and unclear goals to become tangible and concrete objectives as well as clarifying priorities into attainable terms.

An important limitation that arises is the reliability of participant's indicator data that was reported. Individuals that desire to be viewed in a favorable way may be led to respond in a socially desirable way.

The second empirical study testing the effectiveness of TA as a lifestyle change intervention was applied in the context of fitness. Chaffee (2013) focused on participation during Success Map development and the impact of using expert developed Success Maps on the TA process. Methodologies of the TA process were identical from those of Dixon's (2012) study for self-developed conditions, and the process was stopped before system development in the modified condition.

Chaffee (2013) findings suggest that performance outcomes were similar, regardless of condition, but that attitudes toward the process were poorer when Success Maps were developed by experts, however these findings did not adversely affect overall performance and attitudes of acceptance, understanding, ownership, and perceived validity. Motivation to use TA was generally high in both conditions. Results also suggest that there is a positive impact on overall effectiveness when the expert developed Success Maps replaces the self-developed Success Maps. This implies that control, accountability, intrinsic motivation, and the overall success of TA were not dependent upon an individual's participation in Success Map development. This may also mean that the process of clarifying desired feelings and designing their own measures as well as participating in feedback may be enough to fulfill the need for control, accountability, and to maintain intrinsic motivation.

Motivation of Exercise

The challenges that face practitioners in the health fields are holding a maximum motivation levels in their clients when initiating exercise programs. In 2013, Chaffee examined Truly Accomplished as a fitness intervention, and the motivation to use the program to further improve fitness ability. In this study, TA was tested as an individualized intervention, with no other support except weekly meetings with a facilitator. There has been much research in the areas of social support and exercise, and studies have found that individuals have a higher motivation when a positive social influence is present (Lox, Martin Ginis, & Petruzzello, 2006; (Eyler, Brownson, Donatelle, et al., 1999; Carron, Hausenblas, & Mack, 1996). Given what the literature suggests, the addition of a social support component to the TA feedback process may further the motivation to use the system as an intervention. The following section will examine the major concepts of exercise and social influence which can lead to desired behavior changes.

Social Support and the Self Determination Theory

According to Lox, Martin Ginis, and Petruzzello (2006), social support reflects “the most important type of social influence in exercise and other physical activity settings” (p. 106). Social support has a wide variety of definitions, but it appears that the most widely accepted is “an individual’s perception about the availability of support” (Cohen, Gottlieb, & Underwood, 2000).

One study was conducted comparing women with various levels of exercise-specific social support on multiple measures of physical activity behavior, such as leisure-time physical activity and total physical activity (Eyler, Brownson, Donatelle, et al., 1999). When compared with women who reported minimal or no perceived social support, women with medium to high perceived support were less likely to be sedentary and more likely to accumulate 150 minutes of

leisure-time physical activity and 300 minutes of total physical activity per week (Gill, Harber, & Fisher, 2005). These findings suggest that exercise-specific social support may provide the initial motivation to increase physical activity and may play an important factor in moderate physical activity (Eyler, Brownson, Donatelle, et al., 1999).

A meta-analysis that examined the impact of social influence on exercise found social influence is positively associated with exercise behavior, exercise intentions, and attitudes associated with the exercise experience (Carron, Hausenblas, & Mack, 1996). The findings also suggest that support from non-family members, such as physicians or work colleagues, had a stronger influence on exercise behavior rather than support from family members (Eyler, Brownson, Donatelle, et al., 1999). These results were found using a five-item Physical Activity Related Social Support (PASS) self-survey focused on social support from family and friends in the exercise context.

Self-Determination theory (SDT; Deci & Ryan, 2002) assists in the understanding of “why” people initiate, continue, and terminate participation in various exercise related activities (Hagger & Chatzisarantis, 2007). The Basic Needs Theory (BNT), a subcomponent of SDT, is concerned with the role of competence, autonomy, and relatedness needs in relation to motivation and well-being (Deci & Ryan, 2002). *Autonomy* is defined as “being the perceived origin or source of one’s own behavior,” in the context of physical activity (Deci & Ryan, 2002, p.8). A subcomponent of autonomy is *Autonomy support*, which refers to one’s perception of his or her social environment to the extent to which provides choices, acknowledges one’s opinion, and provides rationale when suggesting choices (Sweet et al., 2012). This type of support can refer to authority figures providing meaningful feedback without pressuring compliance, offering

choices, and acknowledging that behavior change is demanding and challenging the perspective of the individual (Deci & Ryan, 2002). *Competence* is defined as feeling successful in an individual's continuous interactions with their social surroundings and experiencing opportunities to express one's capabilities (Deci & Ryan, 2002), while *relatedness* is referred to as the desire to feel connected to others in a physical activity context. When these three psychological needs are fulfilled at a maximum level, there are greater levels of self-determined motivation. The current study will be measuring competence, relatedness, and autonomy of participants with the addition of a social support component to TA.

A cross-sectional studies have shown that exercisers who report more autonomy support from friends (Wilson & Rodgers, 2004) or exercise class instructors (Edmunds, Ntoumanis, & Duda, 2006) reflect more self-determined regulation of exercise participation (Wilson, Mack, & Grattan, 2008). A study was conducted using the theoretical framework of SDT (i.e. the roles of competence, relatedness, and autonomy) which examined the relationship between perceptions of social support and intentions to be physically active (George, Eys, Oddoson, Roy-Charland, Schinke, & Bruner, 2013). The results found that social support is positively related to the satisfaction of psychological needs (i.e. relatedness, competence, autonomy), which in turn, is positively related to perceptions of self-determination and then physical activity intention. This result gives partial insight into how the perception of social support influences health outcomes through motivation (Cohen et al., 2000). Standage et al. (2003), Thorgerson-Ntoumani and Nroumanis (2006) and Wilson and Rodgers (2004) all found strong relationships between the perceptions of self-determination, and future intentions of being physically active. According to

George et al. (2013), results from studies conducted examining SDT reflect the need of directing intervention toward improving perceptions of social support.

Taking into account the research that has been conducted on social support and SDT, adding a social component to the feedback process could yield higher motivation levels to increase and sustain exercise using TA as an intervention system as well as higher levels of self-determination and perceived social support.

Exercise Programming

Truly Accomplished addresses all important key aspects of assisting an individual in an exercise program. TA first uses the To Feel List to narrow down how an individual wants to feel about herself, and directs an individual's thinking to the behavior change she is looking to attain. According to Gallagher and Jakicic, (2002) when assisting someone through an exercise program, the first step is to help the individual understand her motivation and readiness to change her current exercise behaviors. When individuals join a gym or hire a trainer, they are generally more highly motivated to make changes in their lifestyle. Finding the underlying motivation is important when providing feedback and establishing realistic goals for an individual.

Then, Truly Accomplished defines strategies, or certain goals, a person wants to reach that are connected to feelings they want to fulfill. This point in the TA process better clarifies what an individual is looking to change in their lives, and limits it down to specific goals. According to Gallagher & Jakicic (2002), goals are most effective when they are closely linked to the client's motivation for behavior change. It is also important to consider whether the goals

of individual are realistic and attainable. For example, a goal is unrealistic if an individual wants to lose weight but isn't willing to work out more than one day a week.

Lastly, TA then defines quantitative measures of the strategies that an individual defined previously, better clarifying the goals of the individual, and allowing the individual to understand the expectations of the goal.

Another factor that should be highlighted when discussing exercise programming is overcoming motivational barriers. The American College of Sports Medicine has indicated that perceived barriers to regular exercise influence both the adoption and the maintenance of exercise (2001). Therefore, another important step in assisting an individual with exercise programming is to identify the barriers the clients have experienced in the past and plan how to work around those barriers in the future.

A perceived "lack of time" or the perception of being too busy are commonly occurring barriers to exercise (Myers & Roth, 1997). Individuals may report they are too busy to fit exercise into their daily routine and although it may be true in some cases, creative planning and examining a person's daily routine may overcome the barrier (Gallagher & Jakicic, 2002). The barrier of time can be addressed by planning exercise into the daily routine. This may mean scheduling in a day planner or calendar specific times to engage in physical activity. This can also be addressed by encouraging flexibility in the exercise routine.

Being surrounded by an unsupportive environment of exercise can also be a barrier of exercise. It has been suggested that we live in an environment that encourages sedentary lifestyles rather than physical activity (Hill & Peters, 1998; Owen, Leslie, Salmon, & Fotheriogh, 2000).

Barriers can be a common part of any exercise routine, and anticipating these barriers and developing realistic plans to address the problems minimizes the likelihood of a lapse or relapse in the individual. Gallagher and Jakick (2002) suggest monitoring, feedback, and support to help overcome the barriers of an individual's exercise barriers. Research has shown that increasing self-monitoring of a desired behavior change increases compliance with the behavior (Boutelle and Kirschenbaum, 1998). This may be because monitoring allows an individual to be held accountable for themselves and provides a reference point in relation to the goal that has been established for the behavior that needs to be modified or maintained (Gallagher & Jakicic, 2002).

TA helps overcome these barriers found in exercise programming by doing just as Gallagher and Jakick suggested, allowing for self-monitoring and providing feedback. In TA the thought is that individuals develop their own success maps and collect their own data, therefore they know their outcomes. Feedback meetings are done with the facilitator after the data has been collected over a week span. This feedback provides specific things that need to be worked on to gain effectiveness in the priority areas of a person's lifestyle goals.

PURPOSE

The purpose of this study was to examine the effects of social support during the feedback process of Truly Accomplished. Specifically, the study examined the participant's motivation to use TA as a fitness intervention as well as their motivation to initiate and sustain an exercise regimen. A social networking subcomponent was added to the modified TA process throughout the feedback period in which participants were required to post successes and obstacles they face each week, as well as giving feedback to their peers on the group page. According to the literature, positive social influences result in higher levels of motivation when beginning an exercise program.

Using the theoretical basis of previous research, results from this study are expected to reflect that participant's would have a higher level of motivation to use TA as a fitness intervention when accompanied by the social networking component in the modified condition. Participants were also expected to have a higher motivation to initiate and sustain exercise as well as have a higher satisfaction with use of the system overall. Lastly, with the added social support component to TA, participants were expected to have higher levels of self-determination in relation to the three psychological needs (i.e. autonomy, relatedness, and competence) as well as have higher levels of perceived social support.

METHOD

Participants

Thirty women were recruited from an undergraduate population located in a southern university through the SONA system. In order for students to participate in this study, the applicants must 1) be female, 2) show interest in improving fitness ability by answering “yes” to all questions provided on SONA, 3) answer “no” to all questions on the Physical Activity Readiness Questionnaire (PAR-Q) form. This questionnaire is a self-screening tool to assess safety or any possible risks of a person starting an exercise regimen based on “yes” or “no” questions focused on specific health concerns. Participation is entirely voluntary, and each participant will be awarded course extra credit as well as receive an informed consent before participation has begun.

Systems were developed for 42 participants, 21 in the condition with no social support and 21 in condition with the added social support subcomponent. Five participants in the condition with no social support and seven participants in the condition with social support completed systems but failed to follow through to the final feedback meeting. These participants were subsequently excluded from final analysis. The final sample ($N=30$) included 16 participants in the condition with no social support and 14 in the condition with the added social support. Participants' age ranged from 18 years to 46 years ($M=19.83$, $SD=5.25$). The of population was made up of 13.3% African Americans, 50% Caucasians, 20% Hispanic or Latinos, 3.3% Asian Americans, and 3.3% of participants that reported as other. Participation was completely voluntary; each participant was awarded course extra credit and all participants received informed consent.

Design

A between-subjects design was used for the present study. Participants were randomly assigned to one of two conditions. One condition was the normal TA process with only one-on-one facilitator/participant feedback meetings, while the other was a modified TA process that included one-on-one facilitator/participant feedback meetings along with supplemental peer feedback via social networking groups.

Measures were taken at three different times during the study; prior to system development (Time 1), after system development (Time 2), and following the final feedback meeting (Time 3). Aside from the social network component of the modified condition, all other aspects of the TA process were the same for both conditions.

Procedure

Each participant was led through system development by a facilitator, followed by five feedback sessions. Feedback sessions were held on a weekly basis. Test facilitators were randomly assigned to work one-on-one with participants.

Steps in Truly Accomplished To Feel List

As previously described, each participant began system development by a facilitator-led “to feel” exercise that allowed the participant to better clarify what she is looking for in terms of fitness. Participants began by describing their current physical activity levels and the feelings that coincide with their fitness abilities. Then participants were asked to visualize themselves in their best shape and describe the feelings associated with this. From this discussion, a feelings list was developed.

Strategies

Based on the previously defined feelings, the participants were then led through a process to develop strategies. These strategies encompassed the areas the participants were looking to improve in their fitness ability. To better ensure that the participants understood what each strategy entailed, they were asked to describe in a few words what the strategy personally means to them. At least one strategy was recorded for every feeling. The facilitator then checked each strategy to ensure it is stated clearly, encompassed the entire feeling, and had the right amount of detail. The final list of strategies was recorded and was used to develop measures.

Measures

Participants were then led through a process to develop measures based on the previously defined strategies. To do this, participants were asked what measurable and specific actions could be taken to meet their previously defined goals. After a list of measures was created, the facilitator reviewed that each measure (1) maximized the participants' control while minimizing external sources of variance and (2) is reasonably efficient to collect. After the measures were been finalized, the development of Success Maps began.

Success Map Development

Success Maps were developed by the participants from each measure through a facilitator-led process. Success Maps were be developed using Truly Accomplished Success Meter Software following a set of steps: 1) determine the best, worst, and lowest acceptable level of performance for each measure, 2) establish effectiveness scores for the best and worst performance, 3) determine the range of effectiveness for each measure between the best and worst performance and, 4) assign the remaining effectiveness scores that fall between the best

and worst performance values. Each step was described in greater detail in the previous Success Maps section.

Once all success maps were developed for each of the participants' measures, all systems were reviewed for accuracy. Prior to leaving, participants in both conditions were introduced to an example feedback report, and the weekly feedback process was explained. They were instructed to record their daily progress on each measure in their personalized Truly Accomplished Success Meter account. The feedback meeting was then scheduled for each participant one week from system development.

Participants in the modified condition were also led by a facilitator to set up a Facebook account specifically for the participation in the study. Participant's accounts were then be randomly assigned to private Facebook group pages comprised of 4 participants in the modified condition. Participants were required to post in their assigned Facebook group three times a week that they are successfully and continuously tracking. Participants were then required to make a short comment on another participant's tracking throughout the week. Comments were as little as "Well done" or "Keep up the good work." After each weekly feedback meeting, each participant then posted some, or all, of their feedback discussed with their facilitator, as well as at least one measure they weren't performing well on. Each participant also responded to someone else's feedback post and offered a suggestion to help overcome any barriers that person may be facing. The social networking component of the modified TA condition is supplemental, and all other processes of system development and feedback are identical for both conditions.

Feedback Reports/ Collecting Indicator Data

After system development, participants began tracking their performance on each of their measures on a daily basis. Participants were instructed to record any physical activity pertaining to their measures each day in their online Truly Accomplished Success Meter. The initial week of data collection, before the first feedback meeting, was considered a baseline week.

Participants were instructed to not change their daily fitness regimen in relation to their Success Map during the first week of data collection.

Measures

Physiological Measures

Body Composition

Participants' Body Mass Index (BMI) was measured during the first session prior to system development and at the final feedback meeting. BMI is a measure of body shape based on a person's height to weight ratio. The equation, known as the Quetelet index, is defined as an individual's body mass divided by the square of their height (kg/m^2). Another measure of body composition that was used is the Jackson/Pollock 4 site-skin fold test. Assessment of body composition by skinfold measurement is a simple and relatively accurate method that requires minimal equipment. Skinfold measurements can be used in a multiple regression "prediction" equation for estimation of body composition (body density [DB], percent fat [% fat], fat-free weight [FFW], fat weight [FW]). The theoretical basis of skinfold prediction lies in the fact that fat or fat-free tissues accumulate in relatively predictable patterns in individuals of the same gender and similar in age. Four measurements were taken with a set of calipers on the right side

of the body: 1) triceps 2) abdominal 3) suprailium 4) thigh. Measurements were taken at the initial meeting prior to system development and then again at the final feedback meeting.

Fitness Measures

Participants' fitness abilities were measured in a multitude of tests that will be performed during the initial meeting before system development and then again during the final feedback session. Participants' muscular strength and endurance was measured by recording the number of consecutive modified push-ups performed, as well as a timed standard plank and 90-degree wall sit. Participants' cardiovascular fitness was measured by recording the average heart rate after a 3-minute step test using a standardized step height of 16.25 inches and a cadence rate of 22 steps per minute. After the step test was complete, a 15-second pulse count will be taken on the radial site and then multiplied by 4 to determine the participant's heart rate (HR). All measures were recorded and evaluated using procedures listed by the American College of Sports Medicine (Thomas, Gordon, & Pescatello, 2009).

Attitudes

System Development

After system development was completed, participants' attitudes toward their finalized system were measured for acceptance, understanding, ownership, perceived validity, and motivation to use TA. This was a self-report measure using a five-point Likert scale ranging from *Strongly Disagree* (1) to *Strongly Agree* (5). Example items include, "*The Truly Accomplished System is valid*" and "*I understand how my Success Map works.*"

Satisfaction with Truly Accomplished

Participants' satisfaction with TA was assessed at the final feedback meeting and is based off of Chaffee's (2013) and Dixon's (2012) self-report measure. Dixon's (2012) three-item measure will be modified to a five-point Likert scale in the context of fitness, similar to Chaffee's (2013) measure. The rating scale will range from *Strongly Disagree (1)* to *Strongly Agree (5)*. Example items include "*Overall, I am satisfied with the Truly Accomplished process in helping me reach my fitness goals*" or "*I would use Truly Accomplished again to improve my fitness ability.*"

Perceived Social Support

Participants' perceived social support was measured for attachment, social integration, reassurance of worth, guidance, and opportunity using an adapted twelve item version of the Social Provision Scale (SPS; Cutrona & Russell, 1987; $\alpha=.73$ to $.79$). All adaptations are based off of Watson's (2004) modified Social Provisions Scale in the context of exercise. Measurements were taken prior to system development and then again following the final feedback session. A five-point Likert scale will be used ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*. Example items include, "*When I exercise I prefer to have people view me as competent*" and "*When I exercise, there are people who share my interests and concerns.*"

Psychological Needs Satisfaction

Participants' psychological needs satisfaction was measured using an 18-item adapted version of the Psychological Need Satisfaction in Exercise Scale (PNSE; Wilson, Rogers, Rodgers, & Wild, 2006). This is a multidimensional instrument designed to measure perceived psychological need satisfaction in line with Deci and Ryan's (1985, 2002) self-determination theory. Three subscales were measured of SDT: 1) perceived competence, 2) perceived

autonomy and 3) perceived relatedness. Each subscale will contain 6-items of the self-survey. Measurements were taken prior to system development and then again following the final feedback session. A five-point Likert scale will be used ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*. Example items include, “*I feel close to my exercise companions who appreciate how difficult exercise can be*” and “*I feel capable of completing exercises that are challenging to me.*”

Overall Effectiveness

Overall effectiveness was calculated as an effect size (d) for each participant, representing the amount of gain in a participant’s overall effectiveness score. The score serves as the dependent variable in the subsequent analyses. An overall effect size for each participant was calculated by taking the difference between the overall effectiveness score at the final feedback meeting and the overall effectiveness score during baseline, dividing the pooled standard deviation of the overall effectiveness during feedback. The effectiveness score recorded at the first feedback session served as the baseline score.

According to Dixon (2012), the purpose of calculating overall effectiveness as an effect size is to reduce error related to variation in the number of measures per system. For example, a participant could have a higher overall effectiveness score as a result of a higher number of measures included in their system. A higher overall effectiveness score does not always indicate a more superior performance, but sometimes is a result of a larger number of measures. As a result, calculating the effect size of each individual’s effectiveness is a more standard way of measuring overall gains of an individual.

RESULTS

Data Analysis

Data from 16 regular TA process systems and 14 modified TA process systems were prepared and analyzed using SPSS version 22.0 statistical software. Descriptive statistics and intercorrelations for all the study variables are shown in Table 1.

Table 1

Means, Standard Deviations and Intercorrelations of all Study Variables

Variable	N	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
BMI	30	23.92	4.36	1																				
Skinfold(%)	30	25.40	5.72	0.82**	1																			
Plank	30	70.5	35.6	-0.12	-0.23	1																		
Wall-sit	30	71.5	34.1	0.03	-0.05	0.34	1																	
HRDiff	30	17.10	9.43	0.14	0.11	-0.52**	-0.90	1																
TAUNDER	30	26.53	2.81	0.15	0.23	-0.17	0.12	0.13	1															
TAACCEPT	30	22.16	2.58	0.23	0.38*	-0.07	0.13	0.27	0.85**	1														
TAOWNER	30	27.33	2.42	0.20	0.40*	-0.23	0.11	0.24	0.87**	0.91**	1													
TAVALID	30	17.53	2.27	-0.08	0.04	0.04	0.26	0.10	0.58**	0.53**	0.63**	1												
TAMOT	30	4.53	0.63	-0.24	-0.02	-0.01	-0.07	-0.17	0.59**	0.66**	0.60**	0.54**	1											
PNSECOMP	30	24.33	2.59	-0.03	-0.08	0.14	0.04	-0.13	0.03	0.33	0.09	0.31	0.01	1										
PNSEAUTO	30	26.90	3.36	-0.07	0.15	0.07	-0.02	-0.19	0.42*	0.54**	0.46*	0.10	-0.07	0.10	1									
PNSERELA	30	23.56	3.84	0.04	0.11	-0.10	0.20	-0.01	0.31	0.22	0.35	0.48*	0.27	0.02	0.10	1								
SSATTACH	29	15.41	1.86	0.08	0.11	-0.08	0.01	-0.23	0.02	-0.15	-0.05	0.07	-0.18	-0.31	0.10	0.10	1							
SSINTEG	29	16.20	1.80	0.15	0.13	0.13	0.40*	-0.20	0.15	0.12	0.13	0.35	0.24	-0.04	0.03	0.04	0.10	1						
SSWORTH	29	16.44	2.08	0.23	0.17	0.07	0.27	-0.18	0.10	0.02	0.14	0.34	0.12	-0.20	0.14	0.38*	0.61**	0.10	1					
SSGUIDE	29	15.71	2.07	0.21	0.21	-0.16	-0.04	-0.05	-0.21	-0.33	-0.19	-0.15	-0.17	-0.39	-0.18	0.58**	0.42*	0.54*	0.10	1				
SSOPPUR	29	13.86	1.97	0.08	-0.01	0.19	0.19	-0.09	-0.10	-0.13	-0.23	0.10	0.13	-0.27	-0.36	0.43*	0.39*	0.42*	0.47**	0.10	1			
SSALLI	29	17.07	1.91	-0.07	0.11	0.02	0.10	-0.29	0.02	-0.04	0.04	0.01	-0.07	-0.05	0.21	0.51**	0.29	0.39*	0.46*	0.15	0.10	1		
TASATIS	28	36.64	5.52	0.30	0.49**	0.06	0.13	0.10	0.42*	0.64**	0.55**	0.24	0.05	0.27	0.18	-0.09	0.29	0.25	-0.41	0.04	0.11	0.10	1	
D	30	0.22	1.25	0.00	0.02	-0.22	-0.21	-0.48**	0.10	-0.07	-0.20	-0.23	0.14	-0.12	0.14	0.01	-0.06	-0.48**	-0.18	-0.28	-0.37*	0.25	0.10	1

Note. Coefficient alpha reported in the diagonal. BMI= Body Mass Index; Skinfold(%)= Body Fat Percentage; Plank=Plank Seconds; Wall-sit= Wall-sit Seconds; HRDiff= Heart rate difference pre/posttest; TAUNDER= Understanding as part of TA; TAACCEPT= Acceptance as part of TA; TAOWNER= Ownership as part of TA; TAVALID= Perceived Validity as part of TA; TAMOT= Motivation to use TA; PNSECOMP= Perceived Competence; PNSEAUTO= Perceived Autonomy; PNSERELA= Perceived Relatedness; SSATTACH= Attachment in Social Support; SSINTEG= Social Integration; SSWORTH= Reassurance of Worth; SSGUIDE= Guidance; SSOPPUR= Opportunity; SSALLI= Alliance; TASATIS= Satisfaction with TA; D= Overall Effectiveness

Physiological Measures

Physical Fitness

Changes in participant's fitness levels were measured by the total number of consecutive modified pushups without rest, the number of seconds holding a plank, the number of seconds holding a 90-degree wall-sit, and heart rate before and after a 3-minute step-test to an 88 beat cadence. The step used for the step-test was 16 inches tall. Data from fitness measures were collected pre- and post-intervention and analyzed using a paired sample *t*-test. The analyses indicated significant improvements in fitness performance pre- and post-intervention of both the plank test and the push-up test, suggesting support for the effectiveness of TA as a fitness intervention. Descriptive and inferential statistics are shown in Table 2.

Table 2

Descriptive and Inferential Statistics for Physical Fitness Measures Pre- and Post-Intervention

	<u>Pre-intervention</u>	<u>Post-Intervention</u>		
Measure	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i> (30)	<i>p</i>
Push-ups	15.83 (8.75)	20.90 (9.66)	4.062	.000
Plank	73.08 (32.01)	80.52 (35.56)	2.597	.015
Heart Rate Diff.	18.21 (10.06)	17.10 (9.44)	-.731	.471
Wall-sit	63.30 (34.10)	71.52 (34.11)	1.869	.072

Note. Plank and Wall-sit measured in seconds. Heart Rate Diff= Difference between resting heart rate and heart rate post step test.

For each fitness measure an Analysis of Covariance (ANCOVA) was conducted in which condition was the independent variable, post-test variables were the dependent variables, and pre-test fitness scores were the covariate. The test reflects whether the being in the experimental condition versus the control condition influenced fitness measures, controlling for pre-test levels

of fitness. The ANCOVAs showed no significant difference in post-test fitness scores as a function of condition. Descriptive and inferential statistics are shown in Table 3.

Table 3

Descriptive and Inferential Statistics for Physical Fitness Measures Between Conditions

Measure	<u>No Social Support</u>	<u>Social Support</u>	<i>F</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
Push-ups	18.50(8.64)	23.64 (10.32)	0.477	0.496
Plank	85.23 (37.57)	75.43 (34.08)	0.530	0.472
Heart Rate Diff.	15.00 (8.07)	19.69 (10.64)	1.607	0.216
Wall-sit	63.08 (22.34)	81.52 (43.38)	0.645	0.429

Note. Plank and Wall-sit measured in seconds. Heart Rate Diff= Difference between resting heart rate and heart rate post step test.

Body Composition

Changes in body composition were measured using the participant's BMI, body fat percentage measured using the Jackson/Pollock 4 site-skinfold test, fat-free weight (FFW), and fat weight (FW). Data from body composition measures were collected pre- and post-intervention and analyzed using a paired sample *t*-test. The analyses revealed no significant differences in body composition pre- and post-intervention. The descriptive and inferential statistics are listed in Table 4.

Table 4

Descriptive and Inferential Statistics for Physical Fitness Measures Pre- and Post-Intervention

Measure	<u>Pre-intervention</u>	<u>Post-Intervention</u>	<i>t</i> (30)	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
BMI	23.40 (4.42)	23.29 (4.36)	-1.113	.275
Body Fat %	25.93 (5.85)	25.40 (5.72)	-1.645	.111
FW	101.67 (17.03)	104.20 (12.63)	1.234	.227
FFW	37.87 (16.26)	37.50 (15.64)	-.589	.560

For each body composition measure, ANCOVAs revealed no significant differences between the two conditions. Descriptive and inferential statistics for the control and experimental conditions are shown in Table 5.

Table 5

Descriptive and Inferential Statistics for Body Composition Measures Between Conditions

Measure	<u>No Social Support</u>	<u>Social Support</u>	<i>F</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
BMI	23.07 (4.13)	23.54 (4.75)	.100	.754
Body Fat %	25.94 (4.97)	24.79 (6.60)	1.00	.325
FW	103.18 (12.85)	105.36 (12.76)	1.20	.282
FFW	37.63 (15.12)	37.36 (16.77)	.167	.686

Attitudes

The second research question addressed attitudes of condition toward using TA as a fitness intervention, with or without the addition of the social support subcomponent, and the resulting performance of participants. Attitudes of system development and satisfaction with TA were examined to determine if feelings assigned to a participant's success map would impact the success of TA. Perceived social support and psychological needs satisfaction in exercise were analyzed to determine the effect of social support on motivation to initiate and sustain exercise when using TA as a fitness intervention.

System Development

Participant's attitudes toward their finalized systems were measured for acceptance, understanding, ownership, perceived validity, and motivation to use TA. Results were analyzed using an independent samples *t*-test. No significant difference was found between conditions, although no difference was expected at this point in the intervention. However, participants reported high positive attitudes toward their systems, regardless of condition. Results reflected participants responded "agree" or "strongly agree" 94.8% ($n=30$) for understanding, 92.6% ($n=30$) for acceptance, 96.6% ($n=29$) for ownership, 96.2% ($n=30$) for perceived validity, and 93% ($n=30$) for motivation to use TA. Descriptive and inferential statistics are shown in Table 6.

Table 6

Descriptive and Inferential Statistics for Attitudes Toward TA

Measure	<u>No Social Support</u>	<u>Social Support</u>	<i>t</i> (29)	<i>p</i>	<i>df</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Acceptance	22.19 (2.07)	22.14 (3.16)	.046	.963	28
Understanding	21.88 (2.60)	22.57 (2.31)	-.770	.448	28
Ownership	22.94 (1.73)	22.46 (2.29)	.637	.530	27
Perceived Validity	22.06 (2.24)	21.86 (3.18)	.207	.838	28
Motivation to Use	4.05 (0.73)	4.57 (0.51)	-.306	.762	28

Note. Acceptance, Understanding, Ownership are Perceived Validity has a maximum of 25. Motivation to use TA has a maximum of 5.

Results suggest that the majority of participant's attitudes toward system development were positive and did not adversely affect their fitness measures or overall effectiveness.

Satisfaction with Truly Accomplished

The mean level of satisfaction with TA was 36.64 ($SD=5.53$, $n=29$) on a scale with a maximum of 45. Results reflect that items indicated that 82.3% of participants agreed or strongly agreed that they were satisfied with the TA process, while 0% strongly disagreed. No significant difference was found between the condition without the social support subcomponent ($M=37.40$, $SD=3.70$) and the condition with social support ($M=35.77$, $SD=7.15$), $t(29)=-.773$, which suggests that an additional social support subcomponent has no meaningful impact on satisfaction with the TA process.

Perceived Social Support

Participant's perceived social support was measured for attachment, social integration, reassurance of worth, guidance, alliance, and opportunity. Results were analyzed using a Multivariate analysis of covariance (MANCOVA), in which condition was the independent variable, post-test variables were the dependent variables, and pre-test variables were the covariate. No significant difference was found as a function of condition. Descriptive and inferential statistics are shown in Table 7.

Table 7

Descriptive and Inferential Statistics for Perceived Social Support Between Conditions

Measure	<u>No Social Support</u>	<u>Social Support</u>	<i>F</i> (28)	<i>p</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
Attachment	14.80 (1.67)	16.15 (1.95)	1.164	.367
Integration	16.73 (1.67)	15.77 (1.83)	.696	.657
Worth	16.40 (1.88)	16.61 (2.40)	.418	.856
Guidance	15.93 (2.22)	15.46 (1.94)	.562	.754
Opportunity	13.73 (2.19)	14.00 (1.87)	.598	.728
Alliance	17.27 (1.98)	17.00 (1.87)	1.512	.241
Condition			2.135	.461

Note. Integration= Social Integration and Worth= Reassurance of Worth. Attachment, Integration, Worth, Guidance, Opportunity, and Alliance has a maximum of 20.

Results were then analyzed using a paired samples *t*-test to examine attachment, social integration, reassurance of worth, guidance, opportunity, and alliance regardless of condition. Results of the pre- and post-intervention reflected a significant difference in guidance across the sample. Descriptive and inferential statistics are shown in Table 8.

Table 8

Descriptive and Inferential Statistics for Perceived Social Support Pre- and Post-Intervention

Measure	<u>Pre-Intervention</u>	<u>Post-Intervention</u>	<i>t</i> (29)	<i>p</i>	<i>df</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Attachment	15.52 (2.08)	14.41 (1.86)	-.228	.821	28
Integration	15.90 (1.93)	16.21 (1.80)	.699	.491	28
Worth	15.79 (2.46)	16.45 (2.08)	1.184	.246	28
Guidance	14.50 (2.80)	15.71 (2.07)	2.084	.047	28
Opportunity	13.14 (1.41)	13.86 (1.98)	1.771	.087	28
Alliance	17.10 (2.40)	17.07 (1.91)	-.061	.952	28

Note. Integration= Social Integration and Worth= Reassurance of Worth. Attachment, Integration, Worth, Guidance, Opportunity, and Alliance has a maximum of 20.

Psychological Needs Satisfaction in Exercise

Participant's psychological needs satisfaction was measured for perceived competence, perceived autonomy, and perceived relatedness. Results were analyzed using a MANCOVA in which condition was the independent variable, post-test variables were the dependent variables, and pre-test variables were the covariate. No significant differences were found as a function of condition. Descriptive and inferential statistics are shown in Table 9.

Table 9

Descriptive and Inferential Statistics for Psychological Needs Satisfaction Between Conditions

Measure	<u>No Social Support</u>	<u>Social Support</u>	<i>F</i> (30)	<i>p</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
Competence	24.44 (1.63)	24.21 (3.44)	2.285	.106
Autonomy	26.75 (2.70)	27.07 (4.10)	3.559	.030
Relatedness	23.19 (3.71)	24.00 (4.10)	11.025	.000
Condition			1.039	.119

Note. Competence, Autonomy, and Relatedness have a maximum of 30.

Participant's psychological needs satisfaction was then analyzed for perceived competence, perceived autonomy, and perceived relatedness using a paired samples *t*-test to examine the effect of social support on motivation regardless of condition. Results reflected a significant difference in perceived autonomy regardless of condition post-intervention.

Descriptive and inferential statistics are shown in Table 10.

Table 10

Descriptive and Inferential Statistics for Psychological Needs Satisfaction Pre- and Post-Intervention

Measure	<u>Pre-Intervention</u>	<u>Post-Intervention</u>	<i>t</i> (30)	<i>p</i>	<i>df</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Competence	25.67 (3.33)	26.90 (3.37)	1.883	.070	29
Autonomy	22.50 (4.06)	24.33 (2.59)	2.619	.014	29
Relatedness	23.97 (3.17)	23.57 (3.85)	1.087	.286	29

Note. Competence, Autonomy, and Relatedness have a maximum of 30.

Overall Effectiveness

The mean level of effectiveness at baseline was -167.56 ($SD= 110.46$) for the condition with no supplemental social support and -111.86 ($SD= 95.96$) for the condition with the added social support subcomponent. The mean level at the final feedback meeting for the condition with no social support was -47.13 ($SD= 162.15$) and -15.79 ($SD= 120.44$) for the condition with the added social support. Gains in overall effectiveness were calculated for each participant to determine the degree of improvement between the baseline week and final week of feedback. Effectiveness gains in the condition with no added social support were 120.44 ($SD= 178.74$) compared to 96.07 ($SD= 119.57$) in the condition added social support. An independent samples t -test reflected effectiveness gains between the two conditions showed no significant differences, $t(30)= .432$.

As previously discussed, overall effectiveness scores are unstandardized and influenced by the number of measures per system and their assigned effectiveness values. As a result, direct analysis for overall effectiveness scores between participants is not the most appropriate analysis to show behavior change throughout the course of the intervention. A more appropriate method for calculating overall effectiveness is examining effect size of each participant. Individual effect sizes standardize the overall effectiveness score allowing for the score to be unbiased to the number of measures assigned per system. Individual effect sizes ranged from -1.99 to 2.15 ($M=-0.28$, $SD=1.32$, $n=16$) in the condition with no added social support and -0.80 to 2.48 ($M=0.79$, $SD=0.89$, $n=14$) in the condition with added social support. An independent samples t -test showed a significant difference in individual effect sizes between the two conditions, $t(30)=-2.54$, $p=.017$, indicating participants in the condition with added social support had larger increases in effectiveness over the five week feedback period. This finding further supports TA as effective fitness intervention and suggests the added social support throughout the intervention reflects a higher motivation sustain exercise and improve fitness goals.

DISCUSSION

This study was conducted to explore the effect of social support on the TA process. More specifically, this study examined how social support impacted motivation to use TA as a fitness intervention as well as motivation to initiate and sustain exercise. Findings reflected that added social support made no significant difference in the motivation to use TA as a fitness intervention as a function of condition when measured by PNSE or the Social Provisions in Exercise Scale. However, overall effectiveness measures reflected larger gains in effectiveness for the condition with added social support. This significant increase suggests social support influences motivation to sustain exercise and improve previously defined fitness goals. Trends reflect that motivation over time improved in terms of exercise autonomy and perceived guidance throughout the TA process, regardless of condition and improvements were seen in multiple fitness dimensions. As discussed previously, *autonomy* in terms of the Self-Determination theory is defined as “being the perceived origin or source of one’s own behavior.” This theory has a strong link with the participation process TA uses that allows a participant to be responsible for creating their own strategies, measures, and Success Maps based off of the area the user is looking to improve. Each of these findings will be discussed in further detail below.

Physiological Measures

Although no significant differences were found between conditions with the added social support component to the TA process, both conditions showed significant increases in the plank and modified push-up post-intervention. This implies that regardless of condition, using TA as a fitness intervention leads to improved outcomes.

Results of improvements in physiological measures support TA as a behavior change intervention and are significant in support of TA by providing tangible outcomes. These findings further support Dixon's (2012) and Chaffee's (2013) findings, by showing external, objective evidence of the effectiveness of the TA intervention for behavior change. Results also support the link found between an increase in physiological measures post-intervention and an increase in motivation to sustain exercise when using TA as fitness intervention as reflected by the significant increase in perceived autonomy in terms of the psychological needs satisfaction measure. These results support TA as a fitness intervention to improve multiple fitness dimensions and motivation of the user.

No significant changes were found for body composition pre- and post- intervention in terms of BMI and body fat percentage. This is likely due to the time restraint of the intervention, which was a total of five weeks, with only four weeks of feedback. From a physiological standpoint, changes in body composition are not likely to be immediate when beginning an exercise regimen. However, improvement on fitness measures post-intervention suggests that increasing the length of the study may lead to measurable changes in body composition.

Attitudes

The first measure of participant's attitudes was toward system development. No difference was expected between the two conditions in measures of acceptance, understanding,

ownership, perceived validity, and motivation toward the use of TA. During system development, all aspects of the TA process were identical for both conditions. However, as reported in the results, regardless of condition, participants reported high positive attitudes toward their systems. Results reflected participants responded “agree” or “strongly agree” 94.8% for understanding, acceptance, ownership, perceived validity, and motivation to use TA.

As previously discussed, The Pritchard-Ashwood theory (2008) is broken down into five subcomponents: actions, results evaluations, outcomes, and need satisfaction. The theory emphasizes a strong connection between the five components in order maximize motivation. The theory also emphasizes the importance of participation throughout the system development process, which promotes acceptance, understanding, ownership and perceived validity of the system (Naylor, Pritchard, & Ilgen 1980; Pritchard & Ashwood, 2008). Because TA is developed in a series of steps, each step designed to allow for participation. This reinforces the strong connections between each of the five components of the Pritchard-Ashwood theory (2008). Because there were high reported attitudes towards participants systems, regardless of condition, it seems inevitable that results would suggest a significant change in perceived exercise autonomy. These findings complement and extend Chaffee’s (2013) findings which suggest that participation is an important part of the TA process in terms of motivation for behavior change. Findings from this study suggest that perceived exercise autonomy greatly aligns with the participation aspect of the TA process, in turn further supporting TA as a fitness intervention to improve motivation to initiate and sustain exercise, regardless of condition.

No significant differences were found as a function of condition in terms of Satisfaction with TA. However, 82.3% of participants agreed or strongly agreed that they were satisfied with

the TA process. In comparison, Chaffee (2013) found 87.5% of participants agreed or strongly agreed that they were satisfied with the TA process, whereas Dixon's (2012) study found that 78% of participant's agreed or strongly agreed on the same measure. Dixon's (2012) study did not limit participants' systems to be created focused on one area of improvement, but rather encouraged participants to include all aspects on their lives they wish to improve. This reflects that focusing on one area of importance (i.e. fitness, health, ect.) and excluding other areas of potential importance of improvement does not adversely affect overall satisfaction with the TA process. Furthermore, this finding suggests that the addition of a social support subcomponent does not adversely affect satisfaction with TA as an intervention.

Although no significant difference was found between conditions in terms of perceived social support, guidance, a subscale of the Social Provisions measure, reflected a significant increase post-intervention regardless of condition. This finding can be linked closely to the support throughout the system development and the TA process by the participant's assigned facilitator. As previously discussed, there has been much research in the areas of social support and exercise, and studies have found that individuals have a higher motivation when a positive influence is present (Lox, Matrin Ginis, & Petruzello, 2006; Eyer, Brownson, Donatelle, et al., 1999; Carron, Hausenblas, & Mack, 1996). A facilitator's job throughout the TA process is to lead the user through system development while ensuring all the development of the system is under the TA user's control, resulting in maximization of an individual's motivation (Pritchard & Ashwood 2012). After system development, facilitators met with participant's on a weekly basis to review the previous week's feedback report, as well as strategize to improve each measure for the upcoming week. Although this was not the experimental manipulation added to the

intervention, both conditions reflected significant increases in perceived social support in terms of guidance. This finding suggests that social support does effect motivation to initiate and sustain exercise when in the form of guidance in the TA process.

Although no significant difference was found between conditions for the measure of Psychological Needs Satisfaction, a significant increase was shown post-intervention for perceived autonomy, one of the three components of the PSNE scale. As previously discussed, perceived autonomy or freedom of choice, greatly aligns with the TA process. The Pritchard and Ashwood (2008) theory highlight the importance of strong connections between *actions-to-results*, *results-to-evaluations*, *evaluations-to-outcome* and, *outcome-to-need satisfaction* for user's maximum motivation. The connections are influenced by system development, which in turn promote acceptance, understanding, ownership, and perceived validity of a system through a user's participation. A significant increase in perceived autonomy suggests a higher level of motivation to use TA as a fitness intervention to initiate and sustain exercise, regardless of condition post-intervention. A subcomponent of autonomy is *Autonomy support*, which was measured for in the Social Provisions subscale of perceived autonomy, refers to one's perception of his or her environment to the extent to which provides choices, acknowledges one's opinion, and provides rational when suggesting choices (Sweet et al., 2012). This finding, again, can be tied back to the use of a facilitator throughout the TA process. It suggests that social support does affect motivation when in the form of autonomic support in the TA process.

Overall Effectiveness

Results reflected that participant's effectiveness scores increased greatly from baseline to the final feedback meeting. At baseline week, the mean overall effectiveness for both conditions

was -141.57 well below the least acceptable performance value of zero. The final feedback effectiveness score had a mean of -32.50 showing a 109.07 increase in effectiveness throughout the intervention, regardless of condition. The mean effect size for the entire sample was .22. According to Cohen's (1988) criteria .20 is a small effect, .50 is a medium effect, and anything above .80 is a large effect. However, results reflected the condition with the added social support had a significantly higher mean effect size ($d=.78$) than the condition with no added social support ($d=-.28$).

This study's findings suggest that the addition of a social support subcomponent throughout the feedback process of TA had a positive impact on overall effectiveness. This implies that, although not reported in the self-report measures, participants had more successes on their measures than those without the social support subcomponent. A larger gain in overall effectiveness in the social support condition implies that not only does TA work as a fitness intervention, but social support had a positive influence on user's fitness goals.

Limitations

Sample Size

A likely large contributing factor to lack of significant results between conditions for a multitude of measures is lack of sample size. A high attrition rate was seen throughout the study, with 40% of participants either disqualifying to participate or developing a TA system and not completing final measures. According to Linke, Gallo, and Norman (2012), although numerous exercise interventions have been carefully designed and implemented, attrition rates in studies still reflect high numbers (25-50%). The research also reflects participants who do complete these studies typically have a low to moderate adherence rates with a mean of 66%. Because of

the lack of power due to the small sample size, analysis reflected no significant differences between social support measures, among others. Trends shown throughout the study suggest that social support does effect motivation to initiate and sustain exercise given significant changes in overall effectiveness and significant changes regardless of condition. The addition of a social support component to the TA process should be examined again with a larger sample size before ruling out the effect of social support on motivation to use TA as a fitness intervention.

Time

As previously stated, the length of a study is crucial to detect significant changes in health outcomes and physiological changes, as these are not always immediate. This study was limited to six weeks, with five weeks of feedback, which likely contributed to the lack of significant physiological changes seen in pre- and post-intervention measurements of body composition and fitness performance tests. It is important to note that participants improved significantly on the push-up and plank test from their pre-intervention measurements, suggesting that with time participants other physiological measures would also improve.

Facilitator and Training

It is important to consider the impact of the facilitator and training. Each participant was randomly assigned to a facilitator to work one-on-one for the entirety of the study. Each facilitator was assigned between five and eight participants and varied in the degree of knowledge regarding exercise programming. It is possible that the facilitator indirectly impacted individuals' choices of strategies and measures. The differences in each facilitator's personality, explanation of questions regarding system development, and quality of feedback given may have

contributed to a participant's feelings toward the use of TA as an intervention system and experience overall. Training of facilitators was conducted over a multitude of sessions by an experienced facilitator, but the TA software used for the study was a brand new program. Each facilitator was equipped with a protocol to guide participants through the process and ensure they received the same information. However, facilitators were encouraged to include any additional information or explanations and were encouraged to develop a friendly rapport with each one of their participants. Therefore, individual personality differences, quality of communication, and training are all confounding variables to consider.

Generalizability

Generalizability of findings is limited due to the all-female student sample used, with an age range of 18 years to 46 years ($M=19.83$, $SD=5.25$). Additionally, pre-intervention body composition scores indicate that participants were relatively fit prior to beginning the fitness intervention. The mean pre-intervention BMI scores was 23.41, which lies within the range of BMI scores (18.50 – 24.90) considered normal (U.S. Department of Health and Human Services, 2013). Therefore, this restricts generalizability of results to a larger population.

Directions for Future Research

Because this study is the only the third empirical study of TA, there are numerous opportunities and directions for future research. Social support in terms of effect on motivation to initiate and sustain exercise should be examined again with a larger sample size before ruling out the effect of social support in the TA process.

Other ways to capitalize on the findings of social support is to operationalize social support in weekly face-to-face meetings rather than using a Facebook group. This would allow

for quality relationships to be formed between participants, in turn, allowing for more perceived social support than otherwise experienced. Additionally, weekly fitness and health lessons could be taught at these meetings, allowing for a more educational fitness intervention. These additions to the intervention could allow for better overall effectiveness gains and significant physiological changes, as well as more perceived social support throughout the intervention.

Conclusion

This study showed that TA is an effective intervention for positive behavior change, providing additional support to Chaffee's (2013) and Dixon's (2012) findings. TA has shown to be an effective intervention when limited to the context of fitness, further extending Chaffee's (2013) findings. TA was found to have positive effectiveness gains when a social support subcomponent is added to the feedback process. Moreover, findings suggest that the facilitator plays an important role in motivation in terms of guidance and autonomy support throughout the TA process. This study further supported the effectiveness of TA by linking effectiveness scores to objective outcomes, such as fitness measures, and backing TA as an effective fitness intervention.

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