

Fresh start: A group-based intervention to promote physical activity among college freshman

by

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B.S., Kansas State University, 2019

A THESIS

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Kinesiology
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KANSAS STATE UNIVERSITY
Manhattan, Kansas

2020

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Abstract

Physical activity levels tend to decline as students transition from high school to college, and freshmen college women may be particularly susceptible to physical activity barriers. It is possible that providing physical activity resources and support via text messages could assist freshmen women in increasing their physical activity levels. The primary purpose of this study was to evaluate the effects of a mobile group-based intervention for freshmen female college students on physical activity and sedentary behavior. In addition, we examined intervention effects on social support, enjoyment, and stress in this population. Freshmen females (n=30) were recruited to participate in a 9-week intervention that involved wearing a physical activity monitor for three individual weeks (week 0, week 5, and week 9) and receiving tailored weekly messages via GroupMe. Participants were randomly assigned to groups of 6-7 participants, and each group was moderated by one research assistant. GroupMe discussions were specifically formatted to provide physical activity social support, promote physical activity enjoyment, enhance knowledge about benefits of physical activity, suggest ways to decrease sedentary behavior, and increase awareness of various physical activity resources on campus, such as the recreational center. Outcomes were assessed at baseline and post-intervention. Additionally, follow-up focus group sessions were conducted during the fall semester of the participants' sophomore year to gain further feedback about the intervention. We hypothesized that students would demonstrate increases in physical activity, enjoyment, and social support, and decreases in sedentary behavior and stress after participating in the intervention. Results revealed no significant changes in physical activity or sedentary behavior based on objective data from the activPALs. A Wilcoxon Signed-Rank Test of self-reported physical activity and sedentary behavior (International Physical Activity Questionnaire) indicated increases in self-reported

sitting time from baseline to post-intervention ($Z=-2.654, p<0.008$). There were no significant changes in enjoyment, social support, or stress from baseline to post-intervention. A total of 10 participants attended a follow-up focus group session. Key recommendations included incorporating more face to face interaction, a change of topics within the messages to focus on more nutrition and exercise and or guided exercises, and running the intervention during the fall semester rather than the spring. Aspects of the program that participants liked the best included the feedback of activity provided by the activPAL, the idea of using GroupMe for the program, and the length of the program. Overall, results did not align with our hypotheses, but the intervention results and feedback from participants will help with intervention refinement. Future studies should continue to seek creative ways to promote physical activity in this population, with an overall purpose of sustaining physical activity habits beyond the intervention.

Table of Contents

List of Figures	vii
List of Tables	viii
Acknowledgements.....	ix
Chapter 1 - Introduction and Review of Literature.....	1
<i>Physical Activity: The Benefits and Disease</i>	1
<i>Female College Students: Changes Within Their First Year</i>	3
<i>Key Determinants of College Females' Physical Activity: Enjoyment and Social Support</i>	4
<i>Technology: Delivering Interventions and Utilizing the System</i>	6
<i>The Present Study</i>	10
Chapter 2 - Methods.....	11
Study Design.....	11
Participants.....	11
Procedure	12
Intervention.....	13
Measures	14
<i>ActivPal</i>	14
<i>International Physical Activity Questionnaire</i>	15
<i>Physical Activity Enjoyment Scale</i>	15
<i>Social Support for Exercise Scale</i>	16
<i>Perceived Stress Scale</i>	16
<i>Program Evaluation</i>	16
<i>Data Analysis</i>	17
Chapter 3 - Results.....	18
Participant Characteristics	18
Completers Vs. Non-Completers	19
Intervention Engagement (GroupMe Posts)	19
Intervention Effects: Physical Activity and Sedentary Behavior	20
Program Evaluation Results.....	22
Focus Group Evaluation	24

Chapter 4 - Discussion	26
Future Directions	29
Conclusion	31
Chapter 5 - References.....	33
Appendix A - Interview Guide	38
Appendix B - GroupMe Text Messages	39
Appendix C - ActiGraph Feedback Sent to Participants	42
Appendix D - ActivPal Log	44

List of Figures

Figure 3-1: Engagement in GroupMe Week 1-9	20
Figure 3-2: ActivPal Data Reflection of Steps, Stepping Time, Standing Time, and Sedentary Time	21

List of Tables

Table 2-1: Program Evaluation Open-ended Questions	17
Table 3-1: Demographics of the sample at baseline ($N=30$)	18
Table 3-2: Baseline and Post-intervention Scores for IPAQ Variables ($N=19$).....	21
Table 3-3: Baseline and Post-intervention Scores for Enjoyment, Social Support, and Stress Scales ($N=19$)	22

Acknowledgements

There are many people I would like to thank for helping me throughout this process:

Dr. Mailey; Thank you for being my mentor inside and outside the classroom for these past five years. I truly appreciate your guidance and support throughout this process.

Dr. Heinrich and Dr. Rosenkranz; It has been a pleasure working with you both throughout my graduate career. Thank you for your guidance and support throughout this process.

P.A.I.R. Lab; Thank you to everyone that has contributed to this program. I have enjoyed working with you all and wish you the best in your future endeavors.

Kinesiology Department; Thank you all for your support during my time here at K-State. I've enjoyed working with you all and I am looking forward to where we might connect in the future.

Family and friends; Thank you for your support in everything that I do. Your love and support is endless, and I will be forever grateful.

Chapter 1 - Introduction and Review of Literature

Physical Activity

Physical activity is widely promoted; yet 45.8% of American adults still are not meeting the minimum aerobic physical activity guidelines (Centers for Disease Control and Prevention, 2018). It has been proven that physical activity is an effective preventative health strategy and can help reduce the likelihood of chronic diseases. Metabolic syndrome which includes abdominal obesity, high blood pressure, and hyperglycemia, along with other types of chronic diseases are at higher risk for individuals who are physically inactive (NIH, 2001; Ford, Kohl III, Mokdad, & Ajani, 2005).

There are many benefits of physical activity that can help improve the overall health of individuals. Consistent engagement in physical activity has been shown to decrease the likelihood of developing a new chronic condition, slow the progression of existing chronic conditions, and enhance quality of life (2018 Physical Activity Guidelines Advisory Committee, 2018). In addition, with the low amount of physical activity, sedentary behavior has risen to high levels. According to the Sedentary Behavior Research Network, “Sedentary behavior refers to any waking behavior characterized by an energy expenditure ≤ 1.5 METs, while in a sitting, reclining or lying posture” (Tremblay et al., 2017). The relationship between sedentary behavior and chronic disease has become an increasing public health concern. Within the last decade, mortality and other chronic conditions have been linked to excessive sedentary behavior; in addition, extended television-viewing time has been associated with increased cardiovascular disease and all-cause mortality (Ekelund, 2016). The development of interventions to promote physical activity and reduce sedentary behavior is needed.

In addition to the physical health benefits, physical activity has been shown to help alleviate or suppress mental health symptoms for those who experience depression and anxiety. A study within the adult population of Sao Paulo, Brazil was done to explore and evaluate the relationship between physical activity and mood. Results showed that people who did not regularly participate in physical activity demonstrated a 2.1 times increased risk for depression and a 2.5 times increased risk for anxiety (De Mello et al., 2013). Specific forms of physical training such as aerobic exercise or strength training, have been shown to relieve depressive symptoms; even though most people suffering from mental health disorders tend to be less physically active than those who are not experiencing any form of these disorders (Paluska & Schwenk, 2000). Physical activity has been shown to produce many benefits for mental health and enjoyment.

Though stress is not a mental health disorder, it does play a role in leading to mental illnesses. Students tend to exhibit high levels of stress because of their unique socio-demographic age alongside their university experience (Olefir, Kuznetsoc, & Plokhikh, 2019). However, a university encompasses a lot of opportunities for students to engage in leisure time physical activity. Leisure time physical activity has been found to decrease the amount of stressful circumstances college students face, specifically kinesiology and psychology students (Nguyen-Michel, Unger, Hamilton, & Spruijt, 2006). Understanding that stress is highly prevalent in the college student population, it is important to establish mechanisms on how to better handle this important issue. It can be concluded that ineffective stress management techniques from college students need to be reformed (Nguyen-Michel et al., 2006), to ensure better ways to deal with stress. When considering how to cope with stress, one should also include ways to effectively deal with diseases that coincide with increased levels of stress, such as cardiovascular diseases.

Stress has been identified as a risk factor for cardiovascular diseases in early adulthood (Koschel, Young, Navalta, 2017). When researchers understand the benefits of physical activity and the prevalence of stress, specifically among college students, the development of strategic plans to increase the implementation of physical activity and decrease the stress load on these individuals could potentially lead to a decline in stress-related diseases.

Female College Students: Changes Within Their First Year

A lot of changes happen within students' first year of college, including exposure to new people, development of new habits, and adjustment to a heavier workload. Health behaviors are factors that can also change within the first year. A meal plan is usually purchased within the first year to make access to food easier and less of a burden on college students. Most of these meal plans are similar to a buffet style; they allow students to make as many trips through the line as they want and provide many attractive options. Portion sizes are also taken into account when using the meal plan. Because it is set up in a buffet style, students may be unable to correctly portion their food, which in return results in an increased amount of intake (Kasperek, Corwin, Valois, Sargent, & Morris, 2008). In one study, college freshmen women who attended a university gained more weight than those who did not leave home. The possibility of weight gain within this population was shown to be about 15% or more above their ideal weight, compared to those who did not attend college. In fact, those who did attend college instead of staying at home, were 2.6 to 5.2 times as likely to gain weight (Butler, Black, Blue, & Gretebeck, 2004). When examining changes in health it is important to consider the contributing factors, including declines in physical activity.

Females, in particular, may need extra help to promote an active lifestyle, as previous research has found that adolescent males are nearly twice as likely to be active as adolescent

female (Sallis, Zakarian, Hovell, & Hofstetter, 1996). Several studies have found that women exhibit significant declines in physical activity during their transition from high school to college (Leslie, Owen, Bauman, Sallis, & Lo, 1999; Nguyen-Michel et al., 2006). They also explored what could lead to the sudden drop in physical activity in college students. A key barrier to physical activity was study time. The workload from high school to college increases, and as the time students spend studying increases, the amount of time for other activities, such as physical activity, decreases (Nguyen-Michel et al., 2006). Another study was conducted with university students to explore the determinants of physical activity and sedentary behavior using focus group sessions. Utilizing the focus group sessions, information and recommendations on how to increase physical activity and decrease sedentary behavior in their student populations was retrieved (Deliens, Deforche, De Bourdeaudhujj, & Clarys, 2015). Students reported that individual factors (e.g., perceived enjoyment and self-discipline), their social networks (e.g., modeling and social support), the physical environment (e.g., availability and accessibility), and macroenvironment (e.g., media and advertising) affected both their physical and sedentary activities (Deliens et al., 2015).

Key Determinants of Physical Activity in College Females: Enjoyment and Social Support

Enjoyment is an intrinsic motivator for physical activity that can develop immediately or gradually over time. According to past findings, those who find fun and enjoyment in physical activity are more likely to engage in the behavior (Dishman et al., 2005). In an intervention developed for girls to promote physical activity in and outside the classroom, the focus was to enhance adolescent girls' efficacy for physical activity. (Dishman et al., 2005). This intervention resulted in an increase in enjoyment and physical activity in adolescent girls through factors that are known to influence self-efficacy and physical activity (e.g. encouragement or support from

teachers, focusing on accomplishing goals, successful physical activity experiences, etc.) (Dishman et al., 2005). Though the previous study was conducted with adolescent girls, information about enjoyment and physical activity may still be useful and applied to the population of college females. Enjoyment can be facilitated internally by receiving satisfaction from something you like doing, but enjoyment can also be produced externally. An example of external enjoyment is provided through social support; encouragement and comfort from others who are experiencing similar issues can help with motivation and overall enjoyment (Smith, Banting, Eime, O'Sullivan, & Van Uffelen, 2017).

As mentioned previously, the transition from home to college for a first-year student can be very difficult. Universities have recognized the importance of transition for first-year students and have worked to enhance the well-being of their students through social support (Jindal-Snape, 2009). Additionally, social support can influence engagement in physical activity. To determine whether social support had a positive effect on physical activity among adolescents, Prochaska, Rodgers, and Sallis (2002) reviewed 18 studies and found 57% showed a significant positive association between social support and self-reported physical activity. Comfort and encouragement from others who are on the same path toward reaching a similar goal, is a great social support resource, and there are different ways this support can be provided.

Recently, delivering social support interventions through social media platforms has been identified as a potentially strong approach (Cavallo et al., 2012). About 72% of American adults own a smartphone, and more than half (56%) of American adults use at least one social media platform (Greenwood, Perrin, & Duggan, 2016). Targeting physical activity enjoyment and social support via social media could ultimately lead to increased engagement in physical activity.

Technology: Delivering Interventions and Utilization

Communication via technology has grown to be the new standard. Forms of communication that utilize technology include emails, social media, face-to-face calling, and communication-based applications (apps). The smart phone, being one of the most popular forms of communication, involves constant accessibility and adaptability to the needs of the user (Griffiths, Lindenmeyer, Powell, & Thorogood, 2006). This unique and growing communication platform has been adopted in many different areas. Many schools have made the shift to join in on the journey to better equip the next generation and develop a stronger form of communication (Carpenter & Green, 2017).

Though many college professors do not consider mobile technology ideal for the classroom, some have observed increases in students' work ethic and skills within the classroom when utilizing mobile technology, and have noted that it allows for students who prefer to stay quiet in a large lecture hall to have a platform as well (Carpenter & Green, 2017). One application along with many others that have been commonly used by students in the classroom is called GroupMe™ developed by Microsoft. GroupMe is an app that allows for text messaging in large groups and is accessible for all types of smart phones. As a text messaging system, it can be used within and outside of the classroom, and it is available for smart phones and web access; some professors have enjoyed this application to obtain feedback for how well the students are understanding the content and how they can improve (Carpenter & Green, 2017). Students at Elon University have already begun using this platform as a way to post photos about what they are learning in the classroom (Carpenter & Green, 2017). Since everyone does not learn the same way, having something quick and accessible on the computer or on a phone that allows for

multiple ways of learning is a great aid for students. However, there are no public records of studies that have used GroupMe as a tool for physical activity interventions.

Smartphone applications that promote physical activity are becoming more popular with availability of 23,490 health and fitness apps in iTunes and 17,756 health and fitness apps in Google Play (Middelweerd, Mollee, Van der Wal, Brug, & Te Velde, 2014). An intervention was conducted to evaluate the effectiveness of a physical activity intervention that used an internet and phone delivery system versus no guidance (Hurling et al., 2007). The purpose was not to measure the type of physical activity that was being performed, but the amount of physical activity depending on the delivery system. The intervention group had access to an internet and mobile phone-based physical activity program, while the control group received no type of support. Results indicated the test group that had access to physical activity programs and the internet reported a greater increase in physical activity, compared to those who did not have either support of the internet or the mobile phone-based physical activity program (Hurling et al., 2007).

Some mobile physical activity interventions have strived to promote the use of social support. In a systematic review of physical activity interventions, social support and behavioral change theories were two main constructs for future usage of mobile interventions (Tong & Laranjo, 2018). Intervention participants had mixed reviews on the inclusion of social support. Some mentioned they enjoyed engaging in aspects of competition and encouragement, while others seemed to be less enthused because they felt it was more social comparison and needing to fit a certain standard of acceptance (Tong & Laranjo, 2018). Self-monitoring was the most observed behavioral change technique represented from the previous literature (Tong & Laranjo, 2018). It was shown from a previous meta-analysis that most effective interventions included at

least one self-monitoring and another self-regulatory technique (Tong & Laranjo, 2018).

Preferences will vary depending upon the intervention; therefore, instead of making a general intervention, the delivery should focus on the participant population and their characteristics (Tong & Laranjo, 2018).

One-on-one interventions require a large amount of intensive labor; therefore, transferring the same level of interaction and support to a larger scale intervention through technology platforms can be challenging, but could hold great promise for future interventions (Lacroix et al., 2009). Thus, though technology-based interventions are on the rise, more research on how to properly design and administer them is needed. For technology-based interventions to have stronger effects, it has been suggested to allow for a longer follow-up period (>6 months) (Lau, Lau, Wong, & Ransdell, 2011).

Technology has also been used as a form of tracking physical activity and providing activity feedback through instant messages or visuals on a wristband or phone. The Fitbit™, a well-known form of accelerometer, has been used in interventions for participants looking to change their lifestyle. Fitbits have been used as tracking devices in scalable physical activity interventions promoting self-regulation skills and theory-driven encouragement (Cadmus-Bertram, Marcus, Patterson, Parker, & Morey, 2015). For example, Cadmus-Bertram et al. (2015) examined the feasibility and preliminary efficacy of a physical activity intervention that used Fitbits as a feedback tool (Cadmus-Bertram et al., 2015). Compared to a group that used pedometers, the Fitbit group had a significantly greater increase in physical activity, which was also thought to play a role in increased adherence to physical activity (Cadmus-Bertram et al., 2015).

In a meta-analysis, interventions using wearables that tracked physical activity alongside smartphone physical activity promotion applications were evaluated compared to control groups in adult populations (Gal, May, van Overmeeren, Simons, & Monninkhor, 2018). In this meta-analysis, studies measured physical activity in the following ways: objectively using an accelerometer or pedometer, or subjectively using a questionnaire designed for self-reported physical activity (Gal et al., 2018). Results showed the objective measurements displayed a significant improvement in moderate to vigorous activity from baseline to post intervention in the random-effects meta-analysis, compared to the control groups (Gal et al., 2018). Results also showed a significant improvement in step count in the intervention groups compared to the control groups. Overall, greater physical activity was displayed in the groups that had access to the physical activity wearables and applications (Gal et al., 2018). It is promising that physical activity interventions using these combinations of devices have produced increased physical activity in adult populations (Gal et al., 2018).

The activPAL™ is another type of accelerometer used for self-regulation and for tracking physical activity. Attached to the thigh, the activPALs track the individual's behavior (sitting, standing, stepping) during the time period it is worn. Since the monitor is typically worn 24 hours a day, long periods of standing, sitting or lying, and stepping can be identified; sedentary time is classified as time spent sitting or lying. In a study designed to reduce sedentary time in older adults, activPALs were used to help monitor and give visual feedback to the participants (Fitzsimons et al., 2013). Consultations, specifically addressing sedentary behavior, were given to the participants to discuss their activPAL data as well. Results showed that sedentary time decreased by an average of 24 minutes a day, while walking time increased by an average of 13 minutes a day (Fitzsimons et al., 2013).

The Present Study

Though physical activity is widely promoted, only 54.2% of American adults are meeting minimum aerobic physical activity guidelines (Centers for Disease Control and Prevention, 2018). As inactivity continues to be of concern, many interventions have been developed in an effort to address this issue. To our knowledge, no intervention studies that have incorporated activPAL technologies with GroupMe to promote physical activity and reduce sedentary behavior specifically among college freshmen females have been developed or evaluated. With little published about the application and use of activPALs to promote physical activity in addition to reductions in sedentary behavior, this is an area where more studies are needed in order to move the field forward (Chastin et al., 2018).

Therefore, the primary purpose of this study was to evaluate the effectiveness of a mobile group-based intervention for freshmen female college students on physical activity and sedentary behavior. In addition, we examined intervention effects on social support, enjoyment, and stress in this population. We hypothesized that students would demonstrate increases in physical activity, enjoyment, and social support, and decreases in sedentary behavior and stress after participating in the intervention.

Chapter 2 - Methods

Study Design

This pre-post single-group intervention study was designed to target physical activity and sedentary behaviors within college freshmen women. The length of this study was designed to be applicable for a regular semester at a university. Recruitment for the study began within the first two weeks of the spring semester. The intervention lasted a total of nine weeks, with content delivered weekly via GroupMe to small groups of participants. Survey data were collected at baseline and post-intervention through Qualtrics, and activPAL data were collected at baseline (week 0), week 5, and week 9. Upon completion of the intervention in the spring of 2019, follow-up focus group sessions were developed for additional feedback about the intervention. These sessions were facilitated by a research assistant in a university library room and were recorded and transcribed. The study was approved by the university's institutional review board (IRB approval # 9552).

Participants

For this study, we aimed to recruit at least 30 participants to allow for sufficient support and interaction in the GroupMe messaging groups. Study inclusion criteria were assessed through a screening questionnaire sent through Qualtrics. The inclusion criteria were as follows: participant self-identified as a current freshman female student at Kansas State University, able to participate in a program that required reading and writing in English, not pregnant or planning to become pregnant, no limitation by a doctor to participate in physical activity, and accessibility to a cell phone compatible with general phone applications (i.e., GroupMe). Those who did not meet all of the above criteria were excluded from the study. Participants were recruited through freshman-oriented classes on campus via in-person visits or emails distributed to students by the

instructor of the class, a campus online newsletter, and the College of Health and Human Sciences student listserv.

Procedure

Upon completion of the screening questionnaire, those who met all inclusion criteria were requested to attend an orientation. Multiple orientation sessions were offered to accommodate participants' schedules. During the orientation, the intervention was explained. Discussion included activPAL wear: how to place it on their thigh, what to do if it falls off, and where to return and pick up their activPAL. Following the discussion, participants were also introduced to the GroupMe application and its use for the intervention. Once both discussions were completed, participants signed both a social media contract and consent form for the intervention, and then received their activPAL for baseline data collection. At this time, participants also received a link to the online baseline questionnaire and were asked to complete the questionnaire as soon as possible or before they returned their activPAL. Once all baseline data had been collected, participants were randomly assigned to one of four groups of 6–7 participants in GroupMe to provide a more close-knit atmosphere. Each group was moderated by a research assistant, also known as the group leader, and the 9-week intervention began. Participants wore the activPAL again during week 5 and week 9, and received a link to complete the post-intervention questionnaires during week 9.

During the first semester of their sophomore year, participants were sent an email inviting them to participate in a focus group session to discuss the intervention and provide feedback regarding potential changes or improvements. A gift card incentive was provided for those who attended the focus group sessions. Each focus group session was approximately one hour and

was facilitated by a research assistant with the assistance of a pre-developed interview guide (Appendix A).

Intervention

The GroupMe application served as an open communication platform for participant-to-participant and participant-to-group leader interaction. Throughout the 9-week intervention, a weekly topic was assigned that targeted the specific constructs identified for the study. Topics, derived from Social Cognitive Theory (SCT) and Self-Determination Theory (SDT) and tailored to the target population, included: physical activity enjoyment, social support, stress management, knowledge about physical activity, commitment to being physically active, and goal setting. The SCT is used to help promote self-efficacy and incorporate the use of modeling (Bandura, 1998). The topics designed for this intervention aimed to build self-efficacy, break down barriers, and develop a sense of self-regulation. In return, it was expected that these topics would help reduce the perceptions of barriers, provide support for physical activity, and increase self-efficacy for physical activity. SDT aims to facilitate autonomous motivation among individuals (Ryan & Deci, 2017). Some of the content for this intervention (such as social support, enjoyment, and stress management) aligned with SDT goals to build autonomy, competence, and relatedness. Messages encouraged participants to provide support to each other, reframe/redesign physical activity, engage in activities they enjoy, and stay consistent. Utilizing this framework, text messages that were applicable to a main weekly topic were sent three times per week by the group leaders (Appendix B). Engagement between the group leaders and participants, as well as between participants, was encouraged through discussion, questions, and prompts from the group leaders. For example, if we asked whether they had achieved their goal for the week and they responded, we would then go into depth and ask “how did you do it?”,

“what challenges did you face?”, and “how did you feel about it?” In addition to the text messages, to provide feedback regarding their activity levels, the participants received copies of their activPAL data via email (Appendix C) within a week of turning in the activPAL after each wear period.

Measures

ActivPAL

The activPAL is a physical activity and sedentary behavior measurement device that tracks time spent lying/sitting, standing, and stepping throughout the day. This small tracker is attached to the thigh and secured with adhesive tape that allows for unrestricted movement. This device implements the use of an accelerometer that is activated to collect data such as limb position and activity. The participants in this study wore the activPAL for 7 days at each time point. At the end of wear, data were downloaded to the host computer and a visual graphic was produced using the activPAL software. This visual graphic used color to show the amount of time spent standing, sitting, and stepping and the total number of steps per day. In addition to the visual graphic, the activPAL software produced a data file that specified the minutes spent sitting, standing, and stepping each day. For analyses, the days of wear were averaged across the week. The sleep log (Appendix D) was used alongside the wear of the activPAL during weeks 0, 5, and 9 to serve as a reminder that they were wearing the monitor and also monitor time awake and time asleep (Edwardson, Winkler, Bodicoat, Yates, Davies, Dunstan, & Healy, 2017). Participants reported the times they woke up and went to sleep each day. The total time awake was calculated each day in minutes. To accurately assess the amount of waking sedentary time, sleep time was subtracted from total time spent sitting each day.

International Physical Activity Questionnaire

The International Physical Activity Questionnaire (IPAQ) is a questionnaire that is available in both short and long forms to assess physical activity in adults. This study utilized the IPAQ short form. Within this questionnaire, participants reported their daily physical activity in terms of frequency and duration of vigorous, moderate, and walking activities over the last seven days. Behaviors were described as the following to participants: Vigorous (activities that take hard physical effort and make you breathe much harder than normal), Moderate (activities that take moderated physical effort and make you breathe somewhat harder than normal), and Walking (this includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure). MET-minutes per week were calculated for each variable by multiplying the total minutes per week by the MET value for each activity. In addition, participants reported minutes of muscle strengthening activity per week and estimated their usual weekday sitting time in hours. The IPAQ's validity and reliability is comparable to other self-report measures, making it accepted world-wide (Craig et al., 2003).

Physical Activity Enjoyment Scale

The Physical Activity Enjoyment Scale (PACES; Kendzierski & DeCarlo, 1991) measures the degree of enjoyment an individual reports when engaging in physical activity. This 18-item scale rates enjoyment on a 7-point like-type bipolar scale ("It makes me depressed"..."It makes me happy"). To reduce the potential for response bias, some items are reverse scored. After completion of the scale, all responses were summed for a total score for physical activity enjoyment. Higher scores reflected greater enjoyment, and lower scores reflected less enjoyment. The PACES had excellent internal consistency at baseline ($\alpha=.95$) and follow-up ($\alpha=.96$).

Social Support for Exercise Scale

In this intervention, social support was measured using the Social Support for Exercise scale (Sallis, Grossman, Pinksi, Patterson, & Nader, 1987). For this 10-item scale, the statement: *During the past month, my friends or classmates at K-State have*, was followed by social support questions on the scale (e.g., “Gave me the encouragement to stick with my physical activity program”). Answers ranged from 1 (Never) to 5 (Very Often), with 8 (Does not apply) serving as an option that was recoded to 1 (Never). After completion of the scale, all responses were summed for a total score, with higher scores reflecting greater social support. Internal consistency of the scale was very good at baseline ($\alpha=.93$) and follow-up ($\alpha=.94$).

Perceived Stress Scale

The Perceived Stress Scale (PSS) was used to assess participants’ stress levels when faced with situations that could be deemed stressful in their lives (Cohen et al., 1983). Within this scale are 10 items that assess general beliefs about perceived stress (e.g., “In the last month, how often have you been upset because of something happened unexpectedly?”). Answers ranged from 0 (Never) to 4 (Very Often), with 2 (Sometimes) serving as the middle option. The total score was calculated by summing all of the answers. Higher scores reflected greater stress, while lower scores reflected less stress reported by the participant. The PSS had good internal consistency at baseline ($\alpha=.88$) and follow-up ($\alpha=.83$).

Program Evaluation

To obtain qualitative feedback regarding various aspects of the intervention, a brief program evaluation consisting of open-ended questions was given to participants as part of the post-intervention survey (Table 2-1).

Table 2-1: Program Evaluation Open-ended Questions

Question 1	Did receiving your activPAL data motivate you to change your physical activity behavior? If so, what changes did it prompt you to make? If not, why not?
Question 2	Do you feel the information given throughout the 9-week program on the GroupMe App was useful to you? Please explain.
Question 3	What was the most useful part of the GroupMe App?
Question 4	What was the least useful part of the GroupMe App?
Question 5	Now that the study is completed, what you take out, add, or keep the same about the program?
Question 6	If you were telling another freshman about this program, would you suggest it to her? What would you say about it?
Question 7	Thinking about the past few months, do you feel you met your goals? If yes, what helped you the most? If no, what challenges got in your way?
Question 8	Any other comments or suggestions?

Data Analysis

Data were analyzed using SPSS version 25 (IBM Corp, 2017). First, we examined the distributions of all variables to determine whether the assumption of normality was met. Next, we compared baseline scores of completers and non-completers using independent sample t-tests for all normally distributed outcomes; for variables that were highly skewed we used the Mann-Whitney U Test. To examine changes from baseline to post intervention, paired t-tests were used for all normally distributed outcomes; for variables that were highly skewed we used the non-parametric Wilcoxon Signed Rank test. The primary investigator organized the qualitative feedback collected from the program evaluation and focus group sessions into key themes by reading all comments and identifying common themes reported by multiple participants.

Chapter 3 - Results

Participant Characteristics

A total of 46 individuals responded to the advertisement for the intervention, but only 30 participants completed the screening and baseline questionnaires and were officially enrolled in the intervention. Demographic characteristics of the participants are presented in Table 3-1. Nine participants (30%) were Kinesiology/ Athletic Training majors, while the others were from other units across campus. Thirteen (43%) of the participants reported some form of employment, while the other participants indicated that they were not employed. A majority of participants were White (29, 97%) and/or Hispanic/Latino (7, 23%). At the end of the intervention only 19 of the initial 30 participants (63%) completed the post-questionnaire.

Table 2-1: Demographics of the sample at baseline (*N*=30)

Variable	Categories	N/Frequency (%)
Major	Kinesiology/ Athletic Training	9 (30)
	Other	21 (70)
Employment	Yes	13 (43)
	No	17 (57)
Race/Ethnicity	Hispanic and/or Latino	7 (23)
	Asian	1 (3)
	White	29 (97)
	Other	1 (3)

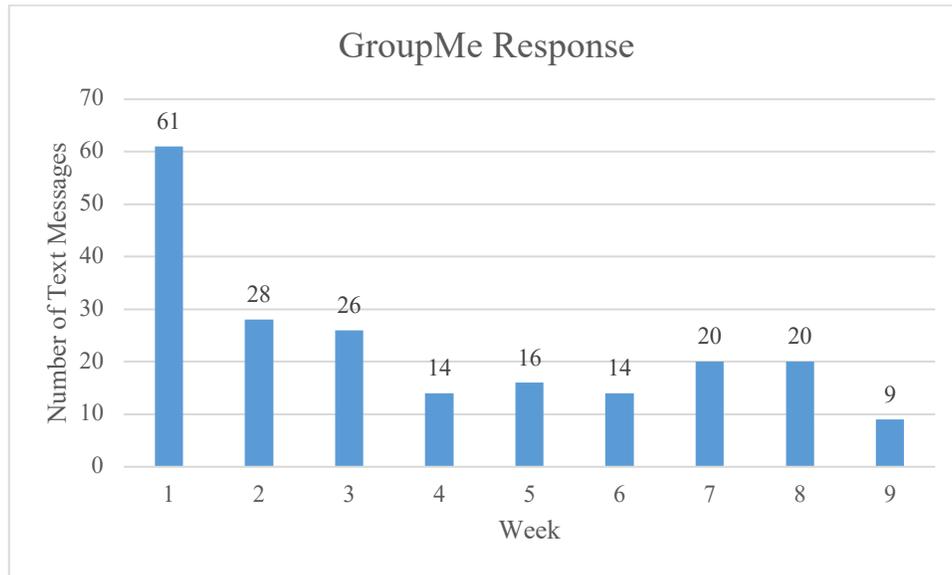
Completers Vs. Non-Completers

Preliminary analyses determined IPAQ data were not normally distributed; therefore, the non-parametric test Mann-Whitney U Test was run. A significant difference between completers and non-completers was observed for IPAQ vigorous intensity activity ($p=0.03$), such that those who dropped out of the study reported significantly lower weekly MET-minutes of vigorous activity [$M(SD)= 512.73 (865.48)$] at baseline than those who completed the study [$M(SD)=1776.84 (1887.24)$]. No baseline differences in activPAL data or in moderate physical activity, walking, muscle strengthening activity, or sitting from the IPAQ were observed. Additionally, participants who completed the intervention indicated higher enjoyment [$M(SD)=103.74(13.74)$, $p=.005$] and greater social support [$M(SD)=32.41(10.34)$, $p=.03$] than those who did not complete the intervention [enjoyment $M(SD)=86.82(16.11)$; social support [$M(SD)=24.36(7.62)$].

Intervention Engagement (GroupMe Posts)

Figure 3-1 displays the total number of text responses that were sent by all the participants each week in GroupMe. GroupMe responses were calculated by retrieving the number of messages sent by each participant and calculating the sum of messages for each week. Responses were measured by actual text responses, not by the likes on a message for interaction. Figure 3-1 shows that responses dropped off significantly after week one. During week one the number of responses were much greater (61 messages) compared to week nine (9 messages).

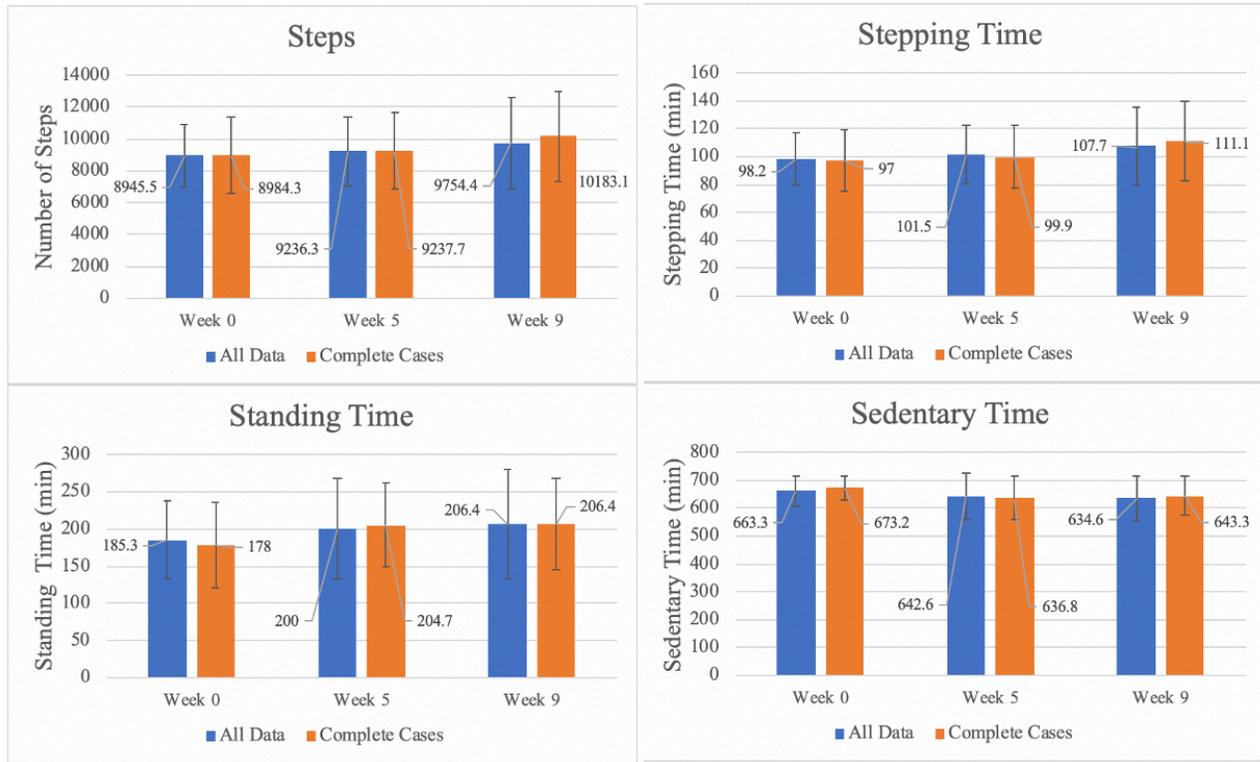
Figure 3-1: Engagement in GroupMe Week 1-9



Intervention Effects: Physical Activity and Sedentary Behavior

At baseline, 28 of the 30 participants had valid activPAL data. At week 5 there were 19 participants with valid data and at week 9 there were 15. Thirteen participants had valid data at all three time points. Figure 3-2 displays the physical activity and sedentary behavior outcomes measured by activPAL. Because of the varying number of participants with valid data at each time point, means were calculated using all available data and using complete cases only. It was hypothesized that participants would demonstrate increases in physical activity and decreases in sedentary behavior after participating in the intervention. Paired t-tests revealed no significant changes from baseline to week 5 or from baseline to week 9. However, Figure 3-2 shows a non-significant trend towards an increase in steps, stepping time, and standing time over the course of nine weeks. Participants also reduced sedentary time by approximately 30 minutes per day over the course of nine weeks; however, this change was not statistically significant.

Figure 3-2: ActivPAL Data Reflection of Steps, Stepping Time, Standing Time, and Sedentary Time



Because the IPAQ data were not normally distributed, Wilcoxon Signed-Rank Tests were used to determine whether self-reported physical activity or sedentary time changed from baseline to post-intervention. Analyses revealed a significant effect for sitting time, such that the median post-test scores were statistically higher than the median pre-test scores ($Z=-2.654, p<0.008$). There were no significant effects for any other IPAQ outcomes (Table 3-2).

Table 3-2: Baseline and Post-intervention Scores for IPAQ Variables ($N=19$)

IPAQ Variables	Baseline $M(SD)$	Post-intervention $M(SD)$	p
Vigorous-intensity Activity MET- Minutes Per Week	1776.84 (1887.24)	1197.00 (1479.28)	0.26
Moderate-intensity Activity MET-Minutes Per Week	802.37 (1221.79)	994.74 (1517.03)	0.93

Walking MET-Minutes Per Week	1550.83 (1109.25)	2019.08 (1629.37)	0.18
Total MET-Minutes Per Week	4148.35 (3078.68)	4193.61 (3382.70)	0.55
Muscle Strengthening Minutes Per Week	99.47 (113.93)	60.26 (64.43)	0.12
Total Minutes Sitting Per Day	360.58 (128.80)	453.16 (157.13)	0.01

Table 3-3 shows the means and standard deviations for the baseline and post-intervention scores for the enjoyment, social support, and stress scales. It was hypothesized that participants would demonstrate increases in enjoyment and social support, and decreases in stress after participating in the intervention. However, results revealed no significant changes in enjoyment ($t=-0.511$, $p=0.62$), social support ($t=1.013$, $p=0.324$), or stress ($t=0.362$, $p=0.772$).

Table 4-3: Baseline and Post-intervention Scores for Enjoyment, Social Support, and Stress Scales ($N=19$)

Variable	Baseline $M(SD)$	Post-intervention $M(SD)$	p
Enjoyment	103.7 (13.7)	105.5 (17.3)	0.62
Social Support	32.4 (10.3)	30.6 (9.6)	0.324
Stress	17.1 (6.8)	16.5 (5.7)	0.722

Program Evaluation Results

The comments provided in the post-intervention questionnaire revealed common themes that may be used to inform changes and improvements in future interventions. Though a majority of the participants stated they would recommend the intervention to other incoming freshman because it was an interesting program that provided unique feedback and support regarding their physical activity, there were themes related to the activPALs and GroupMe application that should be highlighted for future consideration. Participants stated that the activPAL device did

encourage them to work out more; especially because it made them more aware of their activity. One participant said “[...] *it is like a physical reminder and you can see it all the time. And kind of like... well I didn't work out today, so I need to get more active.*” In response to the questions asked about the activPAL playing a major role in their physical activity throughout the program a participant responded “ [...] *it made me want to do stuff because when I looked at the chart, I was like... I need a better chart.*” In addition, participants found the most useful part of the GroupMe application was seeing others' responses and using them as motivation or a reminder to exercise. However, many participants stated that the information provided through the GroupMe application was not as useful as it could be, since it was mostly encouragement and promotion of discussion. They mentioned they would have preferred direct information such as examples of guided exercises, organized group meet ups, and healthy food options for before and after workouts. Most felt there was too much information provided by the group leader throughout the week and not enough people talking to balance it out.

Because no one met each other before the program began, it was hard to start or continue a conversation with someone via text messages. Overall, participants recommended keeping the activPALs as part of the intervention as well as the GroupMe application, but to provide more exercises and allow the opportunity to meet up with others in the group. *“If there had been an initial meeting with our group so we knew each other a little better, I think we would have been more comfortable talking in the GroupMe and getting together to do stuff. As it was, my group never got together for anything.”*

When asked whether they were able to meet their goals for the intervention, participants provided a range of responses. Those who did achieve their goals, such as being more active, felt that having a physical reminder and having a “team” feel to the program really helped. *“Having*

a physical reminder like I haven't worked out today I was able to get back to a more active person" ... "And what I like about this program [...] you feel like you're part of a team again. I would've love to see more of that. Like if we were working out together, we would've known each other." Those who did not meet their goals mentioned barriers such as school, no time, and lack of motivation. This qualitative feedback from the post-intervention questionnaire provided useful considerations for future interventions.

Focus Group Evaluation

The focus group sessions provided additional feedback after about six months had passed. A total of 10 participants attended one of four sessions. Themes expressed in these discussions were similar to those presented in the post-intervention questionnaire. When asked about engagement within the GroupMe groups, similar answers from participants aligned with difficulty in engaging with others whom they have not met: *"I wish I would've been able to actually face to face meet everybody in my group. It was just weird like I wasn't going to be like 'I'll go' with like [...] 'I don't know who you are'."* When asked about challenges related to completing the program or meeting their goals, many mentioned common barriers in relation to being college students: *"I think I would just say other commitments because between like I am in a lot of classes, work, and club activities... it's hard to find time to work out. And when I do have time, I'm so busy the rest of the time that I take this 2-hour break that I have, to just do absolutely nothing. Because I actually have the time to do absolutely nothing, when I could be working out and would probably feel better about myself if I would work out instead of doing nothing."* To potentially limit the barriers or challenges most college students face, we asked if participants would have preferred to complete the program at a different time of the year, such as the fall. Participants generally believed that offering the program during the fall semester would

have been better than other times of year. *“I feel like second semester wasn’t the best. I feel like first semester would’ve been better like first semester freshman year. You are getting to like know the place, move around and try new things. So, I feel like maybe first semester would’ve been better.”* All of this feedback from participants should be taken into consideration to determine what could be feasible and effective for the researchers and participants for future interventions.

Chapter 4 - Discussion

The primary purpose of this study was to evaluate the effects of a mobile group-based intervention for freshmen female college students on physical activity and sedentary behavior. In addition, we examined intervention effects on social support, enjoyment, and stress in this population. It was hypothesized that the students would demonstrate increases in physical activity, enjoyment, and social support, and decreases in sedentary behavior and stress after participating in the intervention. However, this hypothesis was not supported, as results indicated few significant changes from baseline to post-intervention. The only significant change was an increase in self-reported sitting time, which was the opposite of what was hypothesized. Results also showed that GroupMe interaction declined over the course of the intervention, but participant feedback stated the GroupMe could be useful if modified and improved for future programs. Combined, these results indicate poor adherence to the intervention overall. These findings will be discussed in more detail below.

The GroupMe application served as a communication platform and was used to encourage provision of social support among the participants. After the first week of the intervention, GroupMe engagement decreased dramatically. Again, engagement was measured by the number of times the participants responded to the group leader's posts and to other participants in the group. The program began during the beginning of the second semester, when participants were returning from winter break and seemed to have more available time, compared to the end of the semester when school was taking up more of their time due to finals and accumulation of homework and assignments. Another reason, stated in the focus group sessions, why engagement decreased was because participants had not been able to meet the other people in their group face-to-face. In a previous study focused on the effect of information and

communication technologies (ICT) in physical activity interventions for children and adolescents, there were positive effects when ICT was paired with another form of delivery approach, such as face-to-face contact (Lau et al., 2011). Another study about obesity, conducted through the internet and in-person therapy sessions, showed greater weight loss in those who were in in-person therapy sessions as compared to those who were in the internet only intervention (Harvey-Berino et al., 2010). Together, these studies support the notion that face-to-face interaction is more effective alongside technology compared to interventions solely based on technology.

The comparison of completers and dropouts is something of a concern in any intervention. Participants who dropped out of the current study reported less vigorous intensity activity, physical activity enjoyment, and social support than participants who completed the study. Other studies have shown similar findings. For example, a study of older adults showed that participants who exhibited lower levels of self-efficacy were more likely to drop out of the intervention versus individuals who exhibited higher self-efficacy (Jancey et al., 2007). In general, participants who exhibit low levels of physical activity perceptions and behaviors at baseline may be classified as “high-risk.” The “high-risk” participants may need additional support and guidance to successfully complete a physical activity intervention. For example, the screening questionnaire could include a question that asks, “*Are you confident in your ability to exercise despite outside barriers that may influence your adherence to this program?*” If the participant answers no, she would be considered high-risk; she might feel overwhelmed and need additional support from study investigators and/or other participants. For example, high-risk participant could be grouped with others who are more confident in their abilities and can serve as peer role models for solving behavioral problems and enhancing self-esteem (DuBois, Burk-

Braxton, Swenson, Tevendale, Lockerd, & Moran, 2002). With the incorporation of modeling, this could help high-risk participants adhere to the program by encouraging the other participants.

Physical activity and sedentary behavior were assessed both objectively (using the activPAL) and subjectively (using the IPAQ) in this study. Notably, participants reported increased sedentary time on the IPAQ from baseline to post intervention, but the objective activPAL data displayed opposite results. One potential explanation for these findings is that students were more aware of how much they were sitting toward the end of the intervention, and thus self-reported greater sitting time. The activPAL data showed trends across the intervention period that were in the hypothesized direction. Participants noted that they appreciated the feedback from the activPALs. For some, the measurement served as a motivator to increase their physical activity, and for others it served as a reminder of how much they were sitting down throughout the day. Although they enjoyed receiving this feedback, there were still significant barriers that played a role in not being able to achieve their goals. Barriers included school, lack of time, being unsure of what to do at the gym, being tired, having too many meetings, etc.

The current study displayed some strengths welcomed by the participants and the researchers. The first strength was the use of the activPAL accelerometers. Few interventions have used this form of measurement as a feedback tool; therefore, utilizing this tool in the program was unique for the participants and researchers in the program. The activPAL served as an objective measure of physical activity/sedentary time and allowed for visual feedback that could be easily read by the participants. The second strength was the innovative use of technology. Besides the activPAL, the use of the GroupMe application was unique to this study. Incorporating a popular communication application that was easily accessible was a great

foundation for the communication platform for this study. Though interaction within the GroupMe application declined throughout the program, most participants indicated that they enjoyed the GroupMe application and could see better use of it in a future program. The third strength was the large amount of qualitative feedback received, which provided useful information that can be implemented in future interventions.

Though the study was able to be completed, it did not come without some important limitations. This study served as a pilot for future development of a program; therefore, there was no control group. Because there was no control group within this study, we cannot rule out alternative explanations for the lack of changes in physical activity observed. There was also occasional activPAL malfunction, such as the battery dying during the time it was being worn or activity not being recorded for a certain amount of time; therefore, some of the participants were not always able to obtain their full data. To help account for time worn, the activPAL log was required alongside wearing the device, but specific activity types were not to be recorded. It is possible that malfunctions could have impacted the number of dropouts for the program. The GroupMe application also had some limitations. All groups received the same content from one of the four group leaders, but the way the content was delivered and promoted by different group leaders could have impacted the amount of engagement from the participants. The content was not created to require a response unless a question was asked; perhaps implementing other ways for interaction could lead to an increase in responses and further engagement in the program.

Future Directions

Noting the limitations of the study, future directions that may help improve the intervention have been suggested. To build on this pilot study, future studies should include a control group in order to account for potential confounding factors. The control group and

intervention group could both receive activPALs and have access to the GroupMe application, but the intervention group would receive more guided theory-based topics based on the Social Cognitive Theory and Self-determination Theory, while the control would receive general encouragement and reminders to work out. In addition to the including a control group, future studies should consider identifying high-risk participants at baseline and giving them added attention at the start of the intervention to improve retention, as described above. Starting the study earlier (i.e., during the fall semester) instead of at the beginning of the spring semester is also an idea to try for future intervention studies. As a result, a larger sample size may be attained, because there would be more time for recruitment, and the intervention would not end during the time of finals week, where we saw the lowest amount of participation.

Future interventions should incorporate more face-to-face interactions. Participants mentioned that they would have enjoyed meeting the people in the program before it began. One strategy could be to incorporate games to allow participants to get to know one another during the orientation session. Increased face-to-face interaction at the beginning of the intervention could potentially provide a foundation for social support and increase engagement in the GroupMe groups as well as encourage continued face-to-face interaction (e.g., engaging in physical activity together). Participants suggested utilizing the GroupMe polling feature to promote subtle interaction and increased communication in the GroupMe application, along with the suggestion of in person group activities. The content was described as somewhat useful but could use improvement in terms of what is most beneficial for college freshmen women. According to a previous focus group study, recommendations for physical activity interventions include providing information regarding on-campus activities, and implementing sports and activities into the university's curriculum. Students believed that these strategies might also be

able to decrease their sedentary behavior (Deliens et al., 2015). In the current study, feedback from the participants indicated that the GroupMe application was not the most effective form of communication, but had strong potential. It is important to determine how the application might be better used in the future in order to understand how to deliver similar interventions.

Understanding how to tailor technology-based physical activity interventions is important, especially for providing guidance for future interventions. A recent study investigated the association between cognitive variables (i.e., behavioral regulation, motives, and self-efficacy) and physical activity levels while incorporating a wearable device (Lacroix et al., 2009). Overall, results showed that active individuals had a higher level of self-determined behavioral regulation, stronger motives to be active, and experienced higher levels of self-efficacy than inactive individuals. For future interventions, Lacroix et al. (2009) recommend tailoring programs based on participants' underlying cognitive conditions and using persuasive technology to promote active lifestyles (Lacroix, Saini, & Goris, 2009).

Conclusion

Overall this program did not significantly impact college females' physical activity or sedentary behavior, aside from a small increase in self-reported sitting time. Limited engagement was seen in the use of GroupMe after the first week; and engagement was not maintained over the course of the nine-week intervention. Although results did not align with our hypotheses, the intervention results and feedback from participants can be used to inform future interventions. Key recommendations for improvements included incorporating more face-to-face interaction, a change of topics within the messages to focus on more nutrition and exercise and or guided exercises, and running the intervention during the fall semester rather than the spring. Future

studies should continue to seek creative ways to promote physical activity among female college students, with an overall purpose of sustaining physical activity habits beyond the intervention.

Chapter 5 - References

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Appendix A - Interview Guide

Fresh Start Focus Group: Semi-Structured Interview Guide

Introduction:

Hello everyone, welcome back to the new school year. Thank you again for your participation in Fresh Start. For any program, it's important to receive feedback from their participants. Though you all have completed the Post Questionnaire for Fresh Start, we wanted to provide a space to allow expansion on your answers. We would also like to hear your reflections about your experiences in the program and receive some ideas from you all that you think will make the program more effective for others who might be interested in joining. Let's begin.

Questions:

1. Why did you decide to enroll in this program?
2. What effect did this program have on you?
3. What hindered you from completing the program?
4. Did you have any personal goals for this program?
 - a. If so, did you meet them?
5. If anything, what would you change about the program?
6. How physically active were you before the program began?
7. How did the activPAL data play a role in your physical activity throughout the program?
8. How effective do you think the GroupMe communication was throughout the program?
What would you change or keep the same about this form of communication?
9. What are some resources or support you think you need in your community to be consistently active?
10. What are some ongoing barriers you face as a college student that affect your physical activity?
 - a. What do you think might help you overcome these barriers?

Appendix B - GroupMe Text Messages

<p>Week 1/ (2/25-3/1) (What Counts as Physical Activity)</p>
<ul style="list-style-type: none"> • (2/25/19) Hi everyone! Welcome to the FRESH START GroupMe! Today marks the beginning of the 9-week program and I am excited to get started! My name is Mia and I'm a senior at K-State. My favorite way to be active is heading to the gym or going on hikes. Now, let's get to know each of you. Please introduce yourself and tell the rest of the group what types of things you like to do to be physically active! • (2/27/19) Good morning everyone! I hope everyone is staying warm and healthy this week! I heard a lot of people are getting sick. As we approach the middle of the week, I wanted to send some inspiration to get you moving and share with the group! *Image 1 • (3/1/19) Don't have time or energy to go to the gym? You can do a quick workout at home or in your dorm room instead! Fitnessblender.com is a website that I enjoy using. It creates a personalized workout for you based on your preferences, and it's totally FREE!! What kinds of fitness apps or websites do you use?
<p>Week 2/ (3/4-3/8) (Setting Goals)</p>
<ul style="list-style-type: none"> • (3/4/19) Greetings All! This week we are focusing on the topic of setting goals. Goals help us identify what we want to achieve and encourage us to work hard to accomplish them. For this week, let's start with some very small, short-term goals that you are confident you can achieve (you can always build up from there). For an example, I will try a new activity outside once a week with my roommate. Tell the group about one small goal you'd like to accomplish this week! • (3/6/19) *Image 2 • (3/8/19) Did you achieve your goal for this week? Remember to give yourself a reward whether that's a healthy treat or just a night out with your friends! Will you keep the same goal for next week or try something new?
<p>Week 3/ (3/11-3/15) *Spring Break* (Seeking Out Opportunities)</p>
<ul style="list-style-type: none"> • (3/11/19) Greetings All! This week we are focusing on seeking out opportunities to be active. Though you should definitely give yourself time to relax on break, it is easy to take a break from exercise entirely because we are not in our normal routines. Because we might be away on vacation, or just away from the Rec, we need to work on seeking out opportunities to be physically active. This might mean going on a walk on a trail if it's nice outside, or even doing a body-weight exercise in your home. Seeking out opportunities to be physically active will keep you in the routine of being physically active every day. On top of that, switching up a daily routine might make physical activity more enjoyable. Remember, you can be physically active anywhere! • (3/13/19) *Image 3 • (3/15/19) Greetings all! I hope everyone had a restful week. This week we focused on seeking out opportunities to be physically active. Is there any time you can think of this week where you went out of your comfort zone or routine to be physically active?
<p>Week 4/ (3/18-3/22) (Social Support)</p>
<ul style="list-style-type: none"> • (3/18/19) Welcome back everyone! For this week we are focusing on social support. If you feel you are struggling to stay committed to your physical activity routine/goals, ask a group member (or even a family member or close friend) to hold you accountable for the week. Ask that person to send you an encouraging message, check that you followed through on an exercise you had planned to accomplish, or invite them to do an activity with you. Go a step further by each sending some words of encouragement to the entire group! • (3/20/19) Exercise is more fun with others! —Notify a friend of a time you are free to engage in some physical activity. Since the weather is getting nicer, maybe go for a walk outside with a buddy. Find

<p>someone who aligns with your schedule and plan to meet up, then share with the group what you and your workout buddy did.</p> <ul style="list-style-type: none"> • (3/22/19) Have you heard of a class at the REC you want to try out, but haven't yet? Or do you currently attend a fun class at the REC? Invite the group to join you for the next session!
<p>Week 5 (3/25-3/29) (Barriers and Perseverance)</p>
<ul style="list-style-type: none"> • (3/25/19) Hi everyone! College life is busy, and everyone experiences things that get in the way with their exercise plans. Tell the group about a time you weren't able to stick with your plans. What got in the way? • (3/27/19) Keeping the barriers you identified earlier in the week, what are some ways to overcome those? Please share with the group something you hope to try the next time. For example, this week I decided to put working out on my calendar, so it is scheduled into my daily plan. • (3/29/19) Did your strategy for overcoming barriers work? If not, here are some other strategies to try: waking up earlier, set workout clothes out, do an at home workout, schedule it into your daily routine, do two shorter workouts during any breaks in your schedule, have a friend hold you accountable.
<p>Week 6 (4/1-4/5) (Enjoyment)</p>
<ul style="list-style-type: none"> • (4/1/19) Happy Monday! It's a lot easier to stick with exercise if you're doing something you enjoy. If you were to name one type of activity that is truly fun for you, what would it be? • (4/3/19) Exercise is more fun with friends! Send a friend a message today and invite them to join you for a walk, jog, or trip to the REC! • (4/5/19) With this lovely weather, get outside and get active. It's free and FUN to get a group of friends together and play sand volleyball, basketball, or tennis at the REC! How do you plan to take advantage of this warmer weather?
<p>Week 7 (4/8-4/12) (Mental Wellness)</p>
<ul style="list-style-type: none"> • (4/8/19) Greetings All! As this week begins, we wanted to focus on mental wellness; especially since finals are coming up! Physical activity has been shown to help reduce stress - even a 10-minute walk can help. This allows you a chance to get back in touch with your inner self and shift your priorities back on YOU. Do you feel better when you're active? • (4/10/19) Thinking about how physical activity helps you feel better will help shift your focus to immediate benefits. With your schedule already running a little wild because of studying and late-night projects, remember to schedule a break for you to work out to keep yourself balanced and feeling better. YOU GOT THIS! What are some exercises you have been doing to give yourself a break so far this week? • (4/12/19) Looking at your previous or most recent data from the activPALs, where are some areas you think you can be more active? Do you feel better after moving a little more in those areas where you were inactive?
<p>Week 8 (4/15/19) (Evaluating Progress)</p>
<ul style="list-style-type: none"> • (4/15/19) We are already 8 weeks into the Fresh Start program! Think back to the initial goals you set. Have you achieved them? Were they too easy? Too difficult? Tell the group about one goal you have achieved (big or small)! • (4/17/19) Remember to set small, manageable goals you can accomplish daily and write them down in a planner or on a calendar. Be sure to break larger and longer time-frame goals into smaller and more immediate tasks that can be accomplished. You will be much more likely to succeed if you set reminders and don't overwhelm yourself. Let the group know what small task you have accomplished today. • (4/19/19) Reflect on your past and current level of activity involvement. Now that you've had some time to think about your physical activity goals, tell us about one goal you'd like to focus on for the next few weeks. Make sure to treat yourself when you accomplish it!
<p>Week 9 (4/22-4/26) (Looking Ahead)</p>

- (4/22/19) Greetings All! You made it to the last week of Fresh Start! Yay! Take a minute to reflect on the goals you have achieved throughout this project. Tell the group what you're most proud of yourself for achieving!
- (4/24/19) Happy Wednesday! This week we are focusing on making physical activity a lifelong habit. There are going to be ups and downs along the way, but if you continue to set realistic goals and focus on activities you enjoy, you'll be setting yourself up for lifelong success. Is there a new activity you tried, or a new habit you developed this semester that you believe you will sustain?
- (4/26/19) Happy Friday everyone! You made it to the end of the program! Congrats!!! With this project coming to an end, we encourage you to keep prioritizing physical activity in your daily life. Look back on the progress you have made, take what you have learned, and use it to set goals for the future. Thank you for participating in our study!

*Table containing images sent through GroupMe

Image 1	Image 2	Image 3
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SMART GOALS

Setting goals is a great start, but how about being SMART about them? Use the diagram on the left to determine if your goal adheres to all of SMART principles. For example, I made my goal more specific by doing yoga in my house with my roommate twice a week (preferably Tuesday and Thursday) right before we go to bed. When you feel like your goal is SMART, share it with the group!

When you have created your goal for the week, please share with the group and explain the step by step way you incorporated S.M.A.R.T. Goals!

S SPECIFIC
State exactly what you want to accomplish.

M MEASURABLE
Use smaller, mini-goals to measure progress.

A ACHIEVABLE
Make your goal reasonable.

R REALISTIC
Set a goal that is relevant to your life.

T TIMELY
Give yourself time, but set a deadline.

"Setting goals is the first step in turning the invisible into the visible"



Appendix C - activPAL Feedback Sent to Participants



AP740023

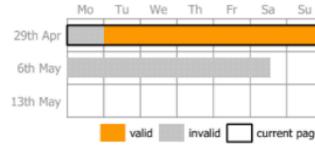
1-1

Mon 29th Apr 2019 0:00

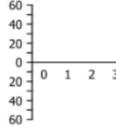
6 valid days (12.5 days recording)



minutes per hour upright → hours per day
minutes per hour sedentary



Monday 29th Apr 2019



Steps

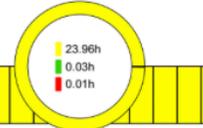
22

Sit to Stands

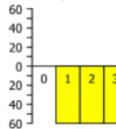
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Activity Score

30 MET.h



Tuesday 30th Apr 2019



Steps

8842

Sit to Stands

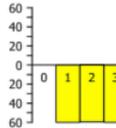
27

Activity Score

34.5 MET.h



Wednesday 1st May 2019



Steps

6640

Sit to Stands

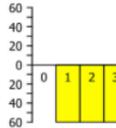
45

Activity Score

33.5 MET.h



Thursday 2nd May 2019



Steps

11234

Sit to Stands

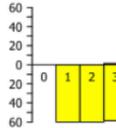
45

Activity Score

35 MET.h



Friday 3rd May 2019



Steps

17710

Sit to Stands

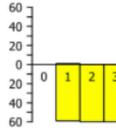
36

Activity Score

37.4 MET.h



Saturday 4th May 2019



Steps

20666

Sit to Stands

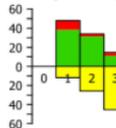
37

Activity Score

38.7 MET.h



Sunday 5th May 2019



Steps

12326

Sit to Stands

44

Activity Score

35.3 MET.h



1-1-AP740023 29Apr19 12-00am for 12d 13h 1m.dabx

Generated by PALanalysis v8.10.8.32 VANE MORA (24 hour wear protocol)

Page 1 of 2

activPAL

1 Mon 29th Apr 2019 - Sat 11th May 2019



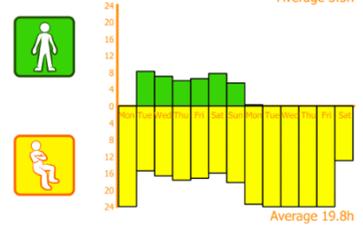
Number of Steps

Average 8739 steps



Sedentary and Upright Time

Average 3.3h



 **PAL Technologies**
PROVIDING THE EVIDENCE

Appendix D - activPAL Log

Participant ID _____

activPAL serial number _____

Start time/date _____

activPAL log

Date								
Time awake								
Time to bed								

Please provide any comments about problems that occurred while you were wearing the unit. If none, write "none."

Instructions: Please record the exact time you go to bed and wake up each day. Be as precise as possible (down to the minute). "Time to bed" is defined as the time you are laying in bed, with all lights and devices turned off, trying to fall asleep.

Please take good care of your monitor! You should wear it 24 hours a day for 7 full days. You can sleep, shower, and swim with it on. We have provided an extra piece of tape for securing the monitor if it starts to come loose. **The monitor is very expensive so it is extremely important that it does not get lost or damaged.** If you notice it coming loose and you do not have more tape to secure it, please either contact us to set up a time to reattach it, or remove it and put it in a safe place until you return it. If you experience extreme itching or irritation, please contact us at patrlab@gmail.com. Thank you for your participation!