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A Family Home Evening Based Method for Improving Physical Activity Levels in Families

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Master of Science

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ABSTRACT

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The prevalence of physical inactivity has been recognized as a risk factor for multiple chronic disease conditions in both adults and children. Recently efforts to increase healthy behaviors have been promoted through religious groups (Ken Resnicow et al., 2002). The Church of Jesus Christ of Latter-day Saints (LDS) has a unique program called Family Home Evening (FHE) that could be used to teach and potentially improve physical activity. Six FHE lessons were designed to be taught in 6 consecutive weeks within a family environment. A total of 84 families (parents and children) were recruited for participation. Participating families were randomized into either the control or intervention group. All family members were given pedometers to be worn one week prior to, and one week after the 6-week intervention. The intervention group FHE lessons covered physical activity promoting topics, and the control group was given traditional religious topics for their FHE lessons.

ANOVA indicated that in children there was an increase in daily steps in the intervention group (12482.8 ± 4455.3) compared to the control group (11255.4 ± 4048.9), which was statistically significant (F (1,85) = 3.93, p=.05). In adults there was an increase in steps in the intervention group from pre to posttest of 8823.5 (SD=3858.3) to 9947.4 (SD=4222.8) this difference was statistically significant (t = -2.94, p<.01). There was no significant change in pedometer steps for the control group in either adults or children.

Results of this study suggest that FHE may be a useful mechanism for increasing steps taken daily. There are other factors that may increase the effectiveness of the lessons such as readiness of the participants to change, number of lessons, lesson content and/or time between lessons.

Keywords: physical activity, religion, pedometers, families, Family Home Evening

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Abstract

The prevalence of physical inactivity has been recognized as a risk factor for multiple chronic disease conditions in both adults and children. Recently efforts to increase healthy behaviors have been promoted through religious groups (Ken Resnicow et al., 2002). The Church of Jesus Christ of Latter-day Saints (LDS) has a unique program called Family Home Evening (FHE) that could be used to teach and potentially improve physical activity.

Six FHE lessons were designed to be taught in 6 consecutive weeks within a family environment. A total of 84 families (parents and children) were recruited for participation. Participating families were randomized into either the control or intervention group. All family members were given pedometers to be worn one week prior to, and one week after the 6-week intervention. The intervention group FHE lessons covered physical activity promoting topics, and the control group was given traditional religious topics for their FHE lessons.

ANOVA indicated that in children there was an increase in daily steps in the intervention group (12482.8 ± 4455.3) compared to the control group (11255.4 ± 4048.9), which was statistically significant (F (1,85) = 3.93, p=.05). In adults there was an increase in steps in the intervention group from pre to posttest of 8823.5 (SD=3858.3) to 9947.4 (SD=4222.8) this difference was statistically significant (t = -2.94, p<.01). There was no significant change in pedometer steps for the control group in either adults or children.

Results of this study suggest that FHE may be a useful mechanism for increasing steps taken daily. There are other factors that may increase the effectiveness of the lessons such as readiness of the participants to change, number of lessons, lesson content and/or time between lessons.

Introduction

Physical activity (PA) is an important lifestyle factor that is related to the reduction of risk for many chronic diseases (Warburton, Nicol, & Bredin, 2006). Due to advances in technology, such as transportation, production automation, communication, and entertainment the amount of activity required to live from day to day has decreased dramatically (Mathieu, Pibarot, & Despres, 2006). As a result of reduced physical activity, the body loses function, allowing certain diseases to develop (Tremblay & Therrien, 2006). These diseases include many chronic conditions that are associated with sedentary living, such as obesity, diabetes, cardiovascular disease, depression, hypertension, osteoarthritis, osteoporosis, and cancer (breast and colon particularly) and can affect both the quality and duration of life (Warburton, et al., 2006).

Furthermore, children are not exempt from the health consequences of physical inactivity. Children spend a majority of their leisure time playing computer and video games, or watching television, all requiring minimal physical exertion (Hesketh, Crawford, & Salmon, 2006). These activities have also been consistently linked to excess weight gain in children (Hesketh, et al., 2006).

An important factor to consider in any health intervention is cultural influence, such as religious affiliation. In Utah, the culture is largely influenced by religion. The majority of Utah's residents are members of The Church of Jesus Christ of Latter-day Saints (LDS). This religion promotes the healthy practices of abstaining from alcohol and tobacco, which has given the LDS community better overall health, when compared to the general population (Aldana, 2005; Merrill & Hillam, 2006; Merrill & Thygerson, 2001; Strawbridge, Cohen, Shema, & Kaplan, 1997). This religion also has additional recommendations to consume whole food in the

form of fruits and vegetables, and to consume meat in moderation, as well as caring for the physical body in general. Unfortunately, these additional recommendations are not as well understood or followed as is abstinence from tobacco and alcohol.

Though the lack of alcohol and tobacco consumption has reduced the incidence of many common diseases, an increasing number of LDS are becoming overweight and obese. In Utah's Health Report, Merrill and Hillam (2006), documented that members of the LDS church were more obese than those not affiliated with the LDS church in Utah. While members of the LDS church have been protected from the ills of tobacco and alcohol, the health related consequences of excess weight is now threatening Utah families as it is across the globe. Since the LDS population is unique in many ways there may also be unique means available for effectively reaching this audience.

Members of The Church of Jesus Christ of Latter-day Saints (LDS) are encouraged to set aside one evening each week for the family. Family Home Evening (FHE), as it is called, is an evening designed for the family, "to study the gospel together and to do other activities that strengthen the family spiritually, create family memories, and increase unity and love" (Family Home Evening, 2008). On this night, parents have the opportunity to teach their children and build family ties. The purpose of this study was to determine whether the long standing LDS institution of FHE could be effectively used to teach families about the importance of physical activity, and increase pedometer steps.

The use of FHE as a physical activity intervention has not been seen in previous studies. There have been other studies using a religious basis for improving physical activity, including one conducted in Black Churches to improve nutrition and physical activity by emphasizing the connection between body and spirit (Ken Resnicow, et al., 2002; Trost, Tang, & Loprinzi, 2009).

However, none have been conducted using The Church of Jesus Christ of Latter-day Saints and the weekly family night.

Home environment and parental attitudes have been linked to physical activity behavior patterns in children. Childhood obesity, for example has been linked to the health behaviors and attitudes of parents (de Marins, Almeida, Pereira, & de Azevedo, 2003; Rising & Lifsitz, 2005; Wagner, et al., 2004). In fact, children have been shown to model their parent's behavior more effectively than behavior they are taught in a classroom (Klohe-Lehman, Freeland-Graves, Clarke, Cai, & Voruganti, 2007). When parents exercise regularly and deem it important, their children are more likely to be physically active (Wagner, et al., 2004). In other words, no matter how well the school system educates children about the benefits of a physically active lifestyle, unless these ideas are reinforced at home, the children are likely to remain sedentary (de Marins, et al., 2003). An intervention focused on improving the health habits in families as a whole may be effective in generating change.

Methods

Subjects

Eighty-four LDS families were recruited through various means: flyers, word of mouth, and referral. Families in the study were required to include both parents and at least two children between the ages of 6 and 16 that were all living at home.

Permission to conduct the study and use human subjects was obtained from Brigham Young University IRB. All adult participants were asked to give consent for themselves and for their children; children were also asked to give assent to participate. The participants were told at the orientation meetings and on the Web page, that if they continued participation they were

giving consent to participate in the study. Participants were also informed that participation was optional and voluntary.

Instruments and Measurement Methods

Baseline physical activity was measured, using pedometers, over a seven-day period during the week immediately prior to the first of the six FHE lessons. Posttest measurements were taken the week following the last (sixth) FHE lesson. Daily pedometer data (steps) were reported in a log provided with the pedometers that were returned at the end of the eight-week period.

After the intervention parents were provided with an opportunity to make anonymous comments and provide feedback about their impressions of the study procedures and FHE lessons. These comments can be found in Appendix C.

Procedures

Volunteers were randomly assigned into either the control or the intervention group. When recruited for the study all participants were told that it was a study about the effect of FHE on health behavior. The participants were informed that they would be receiving six lesson plans posted on a Web page designed for the study, and that they might be different lessons than another family's lessons. The participants were not told what the topic of the lessons would be, only that there were different groups who would have different lessons. Participating families were asked not to discuss the lesson content with other families they knew who were also participating in the study. Both groups were sent a link to a Web site containing six lesson plans. The intervention group Web site contained six FHE lesson plans designed to improve physical activity levels (see Appendix B). The control group received a link to a Web site containing six lessons on normal religious topics, taken from the *Family Home Evening Manual* and other

internet based resources provided through The Church of Jesus Christ of Latter-day Saints (lds.org) chosen to specifically avoid topics that might affect ones level of physical activity.

The six FHE lesson plans for the intervention group were designed to introduce simple principles of health and physical activity and present families with ideas for incorporating more physical activity into their daily lives. The intervention lessons illustrate how important it is to take care of the body from both physical and spiritual perspectives. Scripture, modern revelation, current research and other resources were used to create the lesson content.

The lessons also encouraged families to review their current activity habits and discuss ways to improve levels of physical activity as a family and individually. Families were encouraged to discuss and set realistic goals and work together to achieve them. At the beginning of each lesson (beginning the second week or the study) the family was asked to review the progress that was made the previous week and find ways to improve in different areas. All six lessons followed a similar pattern with a check-up (after the first week), content material, discussion questions, goal setting time, and ideas for activities and (healthy) treats. Families in both groups were asked to teach the lessons in order, one per week, for six consecutive weeks.

Before the intervention period, orientation meetings were held in order to distribute pedometers and familiarize participants with the procedures of the project. Participants were instructed on the use of pedometers, including how, when and where they were to be worn and how to record the steps taken on the log. Those not able to attend the orientation meeting had pedometers taken to them, and received individual instruction. The same instructional material about pedometer use and procedures was also provided on the Web site for both intervention and control groups. The recruitment goal was 80 families, families were continuously recruited until

84 had agreed to participate. Because of the continuous recruitment there were five different start times, with the first group beginning March 23, 2009 and the fifth group beginning May 11, 2009. All five groups had both control and intervention families. Families were assigned into the control or intervention groups randomly, after they had received pedometers and agreed to participate in the study.

All families were asked to thoughtfully study the information provided in the lessons and apply it to their own family's circumstances and individual needs. Each week the families received an email asking them whether or not they were able to hold FHE that week, and approximately what percent of the lesson material was covered. Both groups were asked to wear pedometers the week prior to the first lesson and the week following the sixth lesson.

The intervention period was six consecutive weeks and the study period was eight weeks (one pretest week, six weeks of FHE, and one posttest week). If a lesson was missed the family was instructed to complete the missed lesson the next week and continue the following week with the next consecutive lesson. After completion of the study, families in the control group were also be given access to the FHE lessons on physical activity.

Design and Statistical Analysis

A two (group) by two (trial) ANOVA was used to determine differences in average daily steps from pre to posttest in families and between control and intervention groups. The Statistical Package for the Social Sciences (SPSS) was used for all statistical analyses. Statistical significance was set at $p < 0.05$.

Results

Data Treatment

Average daily steps were calculated from daily steps recorded on participants log when they included at least four weekdays and Saturday. This provided for a total of five days of recorded step counts. Families also needed to complete four of the six FHE lessons to be included in the study. Of the original 122 parents, 104 remained after inclusion criteria were applied. Of those 104 adults 49 were male, and 60 were in the intervention group. When the data were first examined there were several outliers found in the children's pedometer data. Outliers that were more than two standard deviations above or below the average were removed. Combined with the other inclusion criteria applied to adults, of the original 166 children, 98 remained in the data set. This rate of attrition is consistent with similar studies (Morgan, C. F., Beighle, A., & Pangrazi, R. P., 2007). In the 98 children 46 were male and 48 were in the intervention group.

Adults

ANOVA indicate that there was no significance between or within group pretest and posttest differences for changes in average daily steps. Multivariate tests (controlling for age and gender) between intervention and control groups showed a mean difference of 796.1 steps per day and was significant ($F(1,76) = 5.13$, $p = .026$). There were no significant gender differences for average daily steps in either the pretest or posttest.

Paired samples within group tests indicated a pre-test to post-test difference for the intervention group ($t = -2.94$, $p<.01$). The mean difference in steps from pre-test to post-test for participants in the intervention group was 1123.9 (post minus pre) steps per day, indicating that there was an increase in daily average steps from 8823.5 (SD=3858.3) to 9947.4 (SD=4222.8).

There was no difference in the average daily steps in the control group (t = -.338, p = .74). The mean difference from pre-test to post-test in the control group was only an increase of 136.3 average steps per day (See Table 1 and Figure 1).

Children

There were differences in the average daily steps for boys and girls. Average daily steps for boys was 13322.5 (*SD* = 4494.6) and for girls the average daily steps was 9908.59 (*SD* = 3223.9). These differences were significant between groups for both the pretest (F(1,96) = 18.98, p = <.001) and the post-test (F(1,96) = 14.25, p < .001). This gender difference was consistent with other pedometer research in children (Duncan, S. J., Schofield, G., & Duncan, E., 2006).

Results for children were different than adults in the expected direction. Controlling for gender ANOVA indicated that there was a significant within subjects pretest to posttest treatment effect (F(1,85) = 8.12, p < .01). Results also indicated a significant between subjects pretest to posttest effect (F(1,85) = 3.93, p = .05). The mean difference between subjects from pretest to posttest was 1610.8 steps.

Paired samples within group tests indicated a pretest to posttest difference for the intervention group (t = -3.33, p < .01). The mean difference in steps from pretest to posttest for participants in the intervention group was -1227.3 (pretest minus posttest) steps, indicating that there was an increase in daily average steps from 11255.4 (*SD*=4048.9) to 12482.8 (*SD*=4455.3). There was no difference in the average daily steps in the control group (t = 1.395, p = .17). The mean difference from pre-test to post-test in the control group was only an increase of 280.3 average steps per day (See Table 1 Figure 2).

Discussion

This study showed that the six week FHE intervention did have an effect on the amount of daily steps taken (as measured by pedometers) in LDS families. Adults in the intervention group increased their steps and approximated the recommended 10,000 steps/day for adults (Tudor-Locke & Bassett, 2004). Even though the increase in adults was not as large as that in children, it is known that even moderate improvements in physical activity can yield significant health improvements (Warburton et al., 2006). Furthermore, the improvements seen in parents' physical activity may have impacted the activity of all in the home, given that previous studies show that parents' example in areas of health and fitness can influence their children (Wagner, et al., 2004).

Because the present study does not provide for long-term prospective data, assumptions about the long-term effect caused by the FHE lessons cannot be determined. It is possible that these lessons may have caused the participants to consider the importance of physical activity and even though the post test did not show change participants may be more likely to increase physical activity later on. Future research should consider the long-term effect of the potential for FHE to improve health habits in an LDS population.

Additionally, there may be other ways to increase the effectiveness of the study such as considering participant readiness to change, study length, lesson frequency, lesson content, inclusion of nutritional information in the lessons, timing of the lessons and so forth. Because participants did not know the purpose of the study they did not previously have intentions to adjust their physical activity. If families were interested in increasing their physical activity they might find the lessons more useful than a family that had not been considering change. Also, several parents commented after the study that they felt that the lessons were redundant after the

third and that six weeks might be more than necessary (see Appendix C). Another comment was that six consecutive weeks learning about physical activity was excessive and that possibly spreading the lessons out over six months might be more beneficial. Another point brought up was that the participating children were in school during the pre test and were on summer break during the post test. Future research may need to examine the differences in activity levels at different seasons of the year. Another possible angle to consider is whether including nutritional information would increase the effect of the lessons.

Following the intervention many of the participating parents reported that they enjoyed the experience and feel that they are more conscious of their physical activity even if their behavior has not changed at this point (See Appendix C). Many parents also commented that they felt that FHE was a convenient way for them to discuss healthy behaviors with their children in a secure environment.

Even thought there may be several aspects of this study that could be improved, the there was a positive affect from the lessons as they were used in this study. Inactivity has become a serious health risk for many individuals and families. Therefore, health promotion experts are searching for better ways to help the population become more active. This method offers possibilities for increasing physical activity in LDS families.

Conclusion

Results of this study indicate that using FHE is a promising approach for helping families to increase their physical activity. It is hoped that researchers in the future will continue to explore the viability and effectiveness of using religious influences and programs to promote healthy lifestyle change.

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Table 1

Participant Descriptive Statistics

	Control		**Intervention**		**Combined**	
Adults	M	± SD	M	± SD		± SD
age in years	39.7	± 6.27	42.53	± 5.28	41.36	± 5.84
group size (n=)	44		60		104	(male=47%)
Children	M	± SD	M	± SD	Both	± SD
age in years	10.19	± 3.25	12.24	± 3.37	11.25	± 3.45
group size (n=)	43		46		89	(male=52%)

Table 2

Average Daily Steps of Participants

Adults	**Control**		**Intervention**	
	M	± SD	M	± SD
Steps/day pretest	8985.3	± 2851.5	8823.5	± 3858.3
Steps/day posttest	9121.6	± 3386.3	9947.4	± 4222.8
difference pre to post	-136.3		-1123.9*	
Children	**Control**		**Intervention**	
	M	± SD	M	± SD
Steps/day pretest	11362.2	± 4370.95	11255.4	± 4048.9
Steps/day posttest	11642.5	± 4028.7	12482.8	± 4455.3*
difference pre to post	-280.3		-1227.3*	

*was significant at $p < .05$

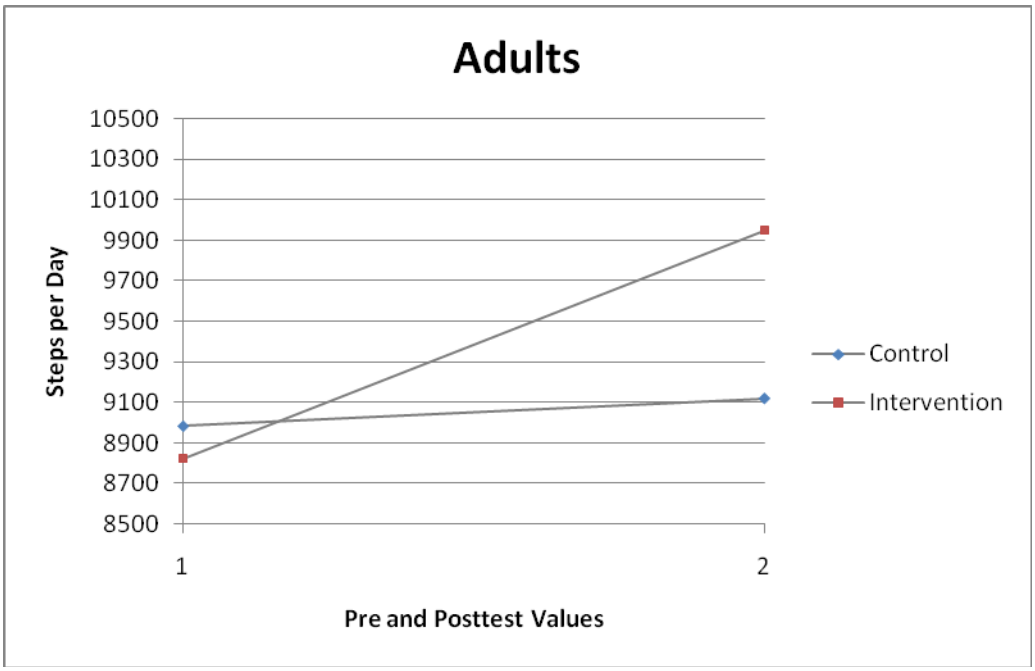

Figure 1. Adults Average Daily Steps Pre and Posttest

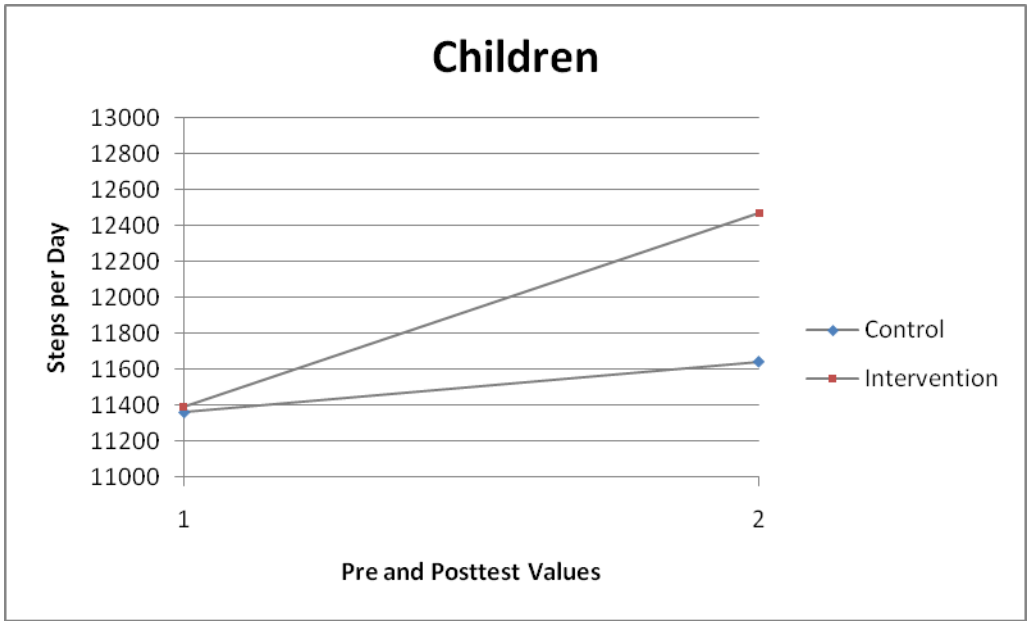

Figure 2. Children Average Daily Steps Pre and Posttest

Appendix A

Prospectus

Chapter 1

Introduction

Physical activity (PA) is one lifestyle factor known to be related to the reduction of risk for many degenerative diseases (Warburton, et al., 2006). Due to many advances in technology, such as transportation, production automation, communication, and entertainment the amount of activity required to live from day to day has decreased dramatically (Mathieu, et al., 2006). As a result of reduced physical activity, the body loses function, allowing certain diseases to develop (Tremblay & Therrien, 2006). These diseases include many chronic conditions that are associated with sedentary living, such as obesity, diabetes, cardiovascular disease, depression, hypertension, osteoarthritis or osteoporosis, and cancer (breast and colon) (Warburton, et al., 2006). These diseases can affect both quality and quantity of life.

Children are not exempt from the health consequences of physical inactivity and also face difficulty in terms of good health practices. Due to the changes in our society, children spend large amounts of their leisure time playing computer and video games, or watching television, all of which require minimal physical exertion (Hesketh, et al., 2006). These activities have also been consistently linked to excess weight gain in children (Hesketh, et al., 2006). Physical activity patterns are not only affected by society, but they are also influenced by many other factors in the home.

Home environment and parental attitudes have been shown to be a contributing factor to the behavioral patterns in children. Childhood obesity, which has been linked to poor health practices, could be reduced or avoided by improving health behaviors of parents (de Marins, et al., 2003; Rising & Lifsitz, 2005; Wagner, et al., 2004). In fact, children have been shown to model their parent's behavior more effectively than behavior they are taught in a classroom

(Klohe-Lehman, et al., 2007). When parents exercise regularly and deem it important, their children are more likely to be physically active (Wagner, et al., 2004). In other words, no matter how well the school system educates children about the benefits of exercise, unless these ideas are reinforced at home, the children are likely to remain sedentary (de Marins, et al., 2003). Therefore, an intervention focused on improving the health habits in families as a whole may be effective in generating change.

Another important factor to consider in any health intervention are cultural influences, such as religious affiliation. In Utah, the culture is largely influenced by religion. The majority of Utah's residents are members of The Church of Jesus Christ of Latter-day Saints (LDS). This religion promotes the healthy practices of abstaining from alcohol and tobacco, which has given the LDS community better overall health, when compared to the general population (Aldana, 2005; Merrill & Hillam, 2006; Merrill & Thygerson, 2001; Strawbridge, et al., 1997). This religion also has additional admonition to consume whole food as well as plenty of fruits and vegetables, as well as meat in moderation. Unfortunately, the direction to eat good foods is not as stringently followed as is abstinence from harmful substances. Though the lack of alcohol and tobacco consumption has prevented many common diseases, an increasing number of Latter-day Saints are becoming overweight and obese. In the Utah's Health Report, Merrill and Hillam (2006), reported that members of the LDS church are more obese than those not affiliated with the LDS church in Utah. Members of the LDS church have been protected from the ills of tobacco, and alcohol, but the health related consequences of excess weight may be threatening Utah families. Since the LDS population is unique in many ways there are also unique means for reaching this audience. One example of this is the program of Family Home Evening (FHE), which is an evening set aside each week for the family.

Using the LDS program of Family Home Evening (FHE), the intervention presented here will seek to teach families to participate together in active pursuits, and form habits that support healthy concepts. Family Home Evening is a program that designates one night a week for the family to spend together. On this night, parents have the opportunity to teach their children and build family ties. This time together could also give the parents an occasion to teach their children about healthy practices. By presenting the information to the family, the parents can teach their families and progress together in a supportive environment. The goal is to determine the potential for improving physical activity levels in families, and thereby reducing health risks associated with inactivity in adults and children, as well as increasing quality of life (Blissmer, et al., 2006).

Statement of the Problem

Studies have shown that family has a strong influence on behavior, however, only few studies have relied upon the family as a means for delivering a behavioral intervention. Also, religious context has been influential in studies of Black churches and Seventh-Day Adventists but few have used the LDS religion for presenting interventions in a religious context. The purpose of this study is to utilize both family and religion, through the institution of Family Home Evening, in order to deliver a health behavior intervention.

Hypothesis

The hypothesis is that the lesson plans provided and implemented will increase the level of physical activity as measured through questionnaires and pedometers. Comparison will be made pre- and posttest, and between intervention and control groups.

Null Hypothesis

The null hypothesis is that there will be no significant difference in physical activity levels from pre- to post testing, or between the control and the intervention group.

Operational Definitions

Physical Activity- any bodily movement produced by skeletal muscles, which results in energy expenditure

Exercise- planned, structured physical activity, often performed with a fitness goal in mind. Both physical activity and exercise can be either aerobic (such as walking or running) or anaerobic (such as weight lifting) (Macera, Hootman, & Sniezek, 2003).

Sedentary- this term is generally defined relative to activity levels of others, therefore it may vary between studies. One sports dictionary defines a sedentary person as one who is "relatively inactive and has a lifestyle characterized by a lot of sitting" (Macera, et al., 2003 pg 122).

Family Home Evening- a night (usually Monday night) reserved for the family, it is a time for learning, and developing quality family experiences. The Web site for the Church of Jesus Christ of Latter-day Saints defines it this way: "Family home evening is a special time set aside each week that brings family members together and strengthens their love for each other, helps them draw closer to Heavenly Father, and encourages them to live righteously."("Family Home Evening," 2008)

Family Unit- father, mother, and at least two children living at home between the ages of six and sixteen.

Pedometer- a device used to measure steps an individual takes and the time spent in activity by sensing the motion of each step. It is an objective measure of physical activity.

Assumptions

1. Adult (parent) participants will read lesson plans and apply the information to their family each week for six weeks.

2. Participants will adhere to pedometer instructions and wear pedometers during the evaluation period and report data accurately.

3. Participants will complete the demographic questionnaire honestly and thoroughly.

Delimitations

This project will study family units consisting of father, mother, and at least two children living at home, between the ages of six and sixteen. The family must either hold regular FHE or must commit to holding it for six consecutive weeks. They must also agree to use the lesson plans provided for the six-week study. The families must have internet access and e-mail to be involved in the study. Parents will sign the informed consent form for themselves and the assent form for their children. The children will also sign an informed consent form. Each member of the family to be included in the study will complete the online questionnaire at the beginning and end of the six weeks of lessons. All subjects must agree to wear pedometers as an objective measure of physical activity each day of the week during the data collection period. Data will be collected the week prior to the study beginning as a baseline measure and the week after the study as a posttest.

Limitations

1. Low generalizability outside LDS families who hold regular FHE and have at least two children between six and sixteen living at home with both parents. As well, Utah has a distinct culture that may prevent this study from being useful in other LDS populations.

2. The time participants engage in activities such as biking and swimming may be difficult to account for since pedometers cannot accurately measure steps taken in these activities.

3. There may be times when pedometers are not worn that reflect inaccurate results.

4. Some activities may cause the pedometer to count steps, when in reality, no steps are taken (for example, putting the pedometer on)

Significance of the Study

Behavioral patterns such as inactivity have become a major health concern. These behaviors are thought to be acquired though various sources such as family and cultural influence. The purpose of this study is to determine whether using FHE as a means for delivering information about healthy lifestyles will increase the physical activity level of the families in the study. This is different from previous studies because it uses both a religious context as well as the family influence to promote change in behavior. Also, it is self directed, rather than researcher driven, since the family implements the lessons by themselves rather than having someone else teaching them. If this method is successful it may provide a valuable resource for other LDS families that are interested in improving their health.

Chapter 2

Review of Literature

Physical Activity and its Benefits

In the past few decades, the physical demands of life have decreased due to technological advances such as transportation, automated production, television, movies and other sedentary leisure-time pursuits (Mathieu, et al., 2006). As a result of changes in activity levels in our society, the population suffers from more chronic illnesses related to sedentary living (Mathieu, et al., 2006).

There have been numerous research efforts that have focused on increasing physical activity, and some of them have indeed demonstrated effectiveness in improving physical activity levels, as well as reductions in chronic disease complications associated with sedentary living.

Sedentary living is a modifiable risk factor that has been associated with many chronic illnesses including cardiovascular disease, cancer, diabetes mellitus, obesity, hypertension, bone and joint disease and depression (Warburton, et al., 2006). Because of the gradual onset of these diseases, most individuals are unaware of their condition until it becomes very serious. For this reason, it is difficult to convince society that a problem exists.

As the body is required to move and expend energy, it is forced to make adaptations in order to compensate for the physical demands placed upon it (Tremblay & Therrien, 2006). As lifestyles and jobs have become more technologically advanced, less movement is required in order to make living and eating possible (Tremblay & Therrien, 2006). When physical demands are not placed on the body, no adaptation occurs and normal body function is potentially lost or depleted. For many, physical activity is seen as a method for increasing energy expenditure in

order to facilitate weight loss however there are many other health benefits that come from participating in physical activity, especially when combined with appropriate diet (Tremblay & Therrien, 2006).

Physical activity (PA) has been shown to protect against the onset and development of many chronic diseases, such as type 2 diabetes, coronary heart disease (CHD), many forms of cancer, some forms of arthritis, obesity, and high blood pressure (Warburton, et al., 2006). Additionally, it is a risk factor that is entirely modifiable, unlike age, gender or heredity. Hu, Willett, Stampfer, Colditz, and Mason, report that both men and women who increased physical activity also reduced their relative risk of death (Hu, et al., 2004). As well as physical activity, improving physical fitness is an important means for reducing risk for all causes of mortality (Hu, et al., 2004; Warburton, et al., 2006). Also, physical activity can be useful in managing a disease once it has already been acquired or diagnosed (Warburton, et al., 2006).

In a meta-analysis of recent literature related to the benefits of physical activity, it was reported that being fit or active was associated with a more than 50% reduction in risk for several chronic diseases. This meta-analysis indicated that men and women who are inactive and/or physically unfit may experience up to 52% increased risk for all cause mortality (Warburton, et al., 2006). Furthermore, it was noted that the greatest improvements in health are seen in individuals who go from a state of low physical activity and adopt a more active lifestyle (Warburton, et al., 2006).

There is also a dose-response relationship associated with physical activity and health risks, suggesting that the more active an individual is, the less risk they have of developing conditions such as cardiovascular disease (Kohl, 2001). Regular physical activity is also

associated with components of psychological well-being such as reduced stress, anxiety, and depression (Moses, Steptoe, Mathews, & Edwards, 1989).

Other specific benefits of physical activity, such as increased hormonal sensitivity have been noted (Tremblay & Therrien, 2006). Affected hormones include regulators such as glucagon and catecholamines which are responsible for maintaining blood glucose levels (Tremblay & Therrien, 2006). It has been determined that exercise can be one of the best protections against both hyperglycemia and hypoglycemia (Tremblay & Therrien, 2006).

Physical inactivity has been associated with a 52% increase in overall mortality, a doubling of mortality from cardiovascular disease, and a 29% increase in mortality from cancer (Hu, et al., 2004). In a longitudinal cohort study of women by Hu et al. the prevalence of either excess weight (determined by a BMI greater than 25) or physical inactivity (less than 3.5 hours per week) was 80.7 % (Hu, et al., 2004). Among this cohort, excess weight and physical inactivity together accounted for 26% of all premature death and 47% of deaths from cardiovascular disease. The study found that obesity and physical inactivity are independently related to mortality, but that a low BMI cannot make up for the risks associated with low physical activity. Women who were both lean and physically active had the lowest mortality rates (Hu, et al., 2004). In other words, physical activity is beneficial because it decreases risk of disease, but also because it is often associated with maintaining healthy weight (Hu, et al., 2004).

There is limited research regarding how much physical activity is required in order to be beneficial both for decreasing health risks associated with inactivity as well as reducing the risk of disease caused by obesity. In a study involving two experimental groups, one group was assigned to an energy expenditure goal of 1000 kcal/wk, while the other group was assigned to an energy expenditure goal of 2500 kcal/wk (Schoeller, 2003). Both groups were asked to

reduce their energy intake to 1000-1500 kcal/wk (Schoeller, 2003). At the end of six months there was no difference between the two groups in terms of weight loss. However, at twelve months follow-up those in the higher physical activity group were able to maintain their weight, whereas the lower physical activity group had a 2-kg regain (Schoeller, 2003). By the 18 month follow-up period the difference between the two groups had mostly disappeared, but it is unknown whether this is due to lower compliance or some other factor (Schoeller, 2003). Increased physical activity may have the potential to help maintain a healthy body weight over a longer period of time (Schoeller, 2003).

Exercise has been shown to increase the efficiency of the heart and other components of the circulatory system. Along with improving the amount of work the heart can do, exercise also tends to reduce blood pressure in those who regularly participate (Tremblay & Therrien, 2006). This is documented by a study using Meridia, a drug that suppresses appetite and increased blood pressure and heart rate as a side effect (Tremblay & Therrien, 2006). The study was designed to determine whether the effects of exercise could reduce the increased blood pressure caused by Meridia (Tremblay & Therrien, 2006). Subjects were given Meridia for six weeks and blood pressure was measured during this time (Tremblay & Therrien, 2006). After six weeks, exercise was introduced and the blood pressure continued to be monitored (Tremblay & Therrien, 2006). The introduction of exercise almost completely negated the effect of the drug on blood pressure. The results of this study suggest that exercise has a potentially stronger affect on the functionality of the heart than even side effects of medication (Tremblay & Therrien, 2006).

Although physical activity is related to body composition and weight, the benefits of physical activity on blood pressure have been seen even in the absence of weight loss (Whelton, Chin, Xin, & He, 2002). In a meta-analysis of 54 studies it was noted that previously sedentary

individuals could expect 3.8 mmHg and 2.6 mmHg decreases in systolic and diastolic BP, respectively, with regular aerobic exercise (Whelton, et al., 2002). Blood pressure is a strong risk factor for several cardiovascular diseases. Also important to note is that this effect was seen in both hypertensive and normotensive individuals as well as normal weight and overweight individuals and among black, white and Asian participants (Whelton, et al., 2002). This finding indicates the importance of participating in PA, even in the absence of known risk factors. It also shows that all races and genders can experience improved blood pressure through regular physical activity, even among different weight categories. Physical activity is important for people of all races, ages, and genders, and the lack of PA can lead to disease and illness.

As one publication reported, "poor dietary patterns and sedentary lifestyle together account for between 300 000 and 500 000 deaths each year" (Reniscow et al., 2002 pg. 562). This puts these factors second only to tobacco use as the most harmful preventable cause of death (Ken Resnicow, et al., 2002).

Current Activity Levels

In order to understand fully the impact of this research, it is important to view it in the context of the current activity levels in our society. A state-based telephone survey of the U.S. civilian, noninstitutionalized population aged 18 years and older, revealed there is a high prevalence of individuals that do not engage in leisure-time physical activity (*Prevalence of No Leisure-Time Physical Activity ---35 States and the District of Columbia, 1988--2002*, 2004). The data for this report was collected between 1988 and 2002 using a random-digit-dialed telephone survey. No leisure-time physical activity was defined as a "no" response to the survey question, "During the past month, other than your regular job, did you participate in any physical activities or exercise such as running, calisthenics, golf, gardening, or walking for exercise?"

(*Prevalence of No Leisure-Time Physical Activity ---35 States and the District of Columbia, 1988--2002*, 2004). Survey results indicate the prevalence of no leisure-time physical activity of Americans seems to have peaked in 1989 at approximately 32% and was stable until 1996, after which it declined an average of 1% per year to 25% in 2002 (*Prevalence of No Leisure-Time Physical Activity ---35 States and the District of Columbia, 1988--2002*, 2004). There were slight differences between gender, in men decreasing from 29% to 22% and in women decreasing from 32% to 28% (*Prevalence of No Leisure-Time Physical Activity ---35 States and the District of Columbia, 1988--2002*, 2004) According to this report the overall prevalence of no leisure-time physical activity was at its lowest point in 2002. Despite the decreasing percent of no leisure-time physical activity, the rate of obesity increased during these years. Consequently the amount of physical activity in those who report a "yes" in the survey may not be sufficient to result in a balance of the calories consumed versus calories burned. However, there are several limitations to this study that would prevent robust conclusions (*Prevalence of No Leisure-Time Physical Activity ---35 States and the District of Columbia, 1988--2002*, 2004).

One of the main contributors to the prevalence of sedentary life styles in our society, is the switch to knowledge based work (KBW) rather than physical work. One report found that there are similar stresses and appetites caused by KBW, but less actual energy demand. This relationship was explored by Tremblay and Therrien (2006), who found that in several studies energy consumption increased after a bout of cognitive stress. The amount of energy required in order to perform a cognitive task such as dictating is the same, or similar to that required to read a newspaper. However, the appetite is greater after the dictation or other stressful situations than it was after the more relaxing activity. This increased mental strain generally results in more energy consumption (Tremblay & Therrien, 2006). In other words, it has become common in our

society to deal with the increase in mental and emotional stress with increased food/calorie consumption even though the energy demands placed on individuals has decreased (Tremblay & Therrien, 2006). This can results in a positive energy balance, which leads to weight gain.

A study designed to evaluate the difference between males and females in sedentary behavioral patterns was performed in youth of nine different European countries (te Velda, et al., 2007). The study discovered consistent differences in boys and girls regarding the association between overweight and the patterns of sedentary behaviors and physical activity. The resulting conclusion was that boys seem to engage in more physical activity than girls, but also accumulate more sedentary time than girls (te Velda, et al., 2007). Also interesting was that in boys, weight status was influenced both by the amount of physical activity they participated in as well as their involvement in sedentary activities. Girls' weight, on the other hand, seemed to be more influenced by their level of sedentary behavior, (TV viewing, PC use, etc.), than their physical exercise (te Velda, et al., 2007). The method for data collection (self-report and questionnaire) in this study make it incapable of concluding causal relationships between these factors and therefore it cannot be determined whether sedentary behavior leads to weight gain, or if overweight individuals tend to engage in sedentary behavior (te Velda, et al., 2007).

Barriers to Exercise and PA Participation

Ignorance. Perhaps individuals do not increase their physical activity levels because they do not realize that they are at risk. This question was examined in a cross sectional study with individuals diagnosed with hypertension and/or hypercholesterolemia and/or type 2 diabetes mellitus (T2DM) (van Sluijs, Griffin, & van Poppel, 2007). The study focused specifically on the correlation between perceived threat because of sedentary living and motivation to change physical activity observance. Individuals were assessed using questionnaires in order to

determine age, education, current work, smoking status, and level of physical activity (using number of minutes spent in at least moderate intensity physical activity). Awareness of physical activity was determined using a separate questionnaire. The researchers defined awareness as consistency between the level of reported physical activity and self-rated physical activity, and comparing these levels to the current recommended level of physical activity. The study reported that 61.4% of the inactive participants rated themselves sufficiently active even though they did not meet the recommendations. There was only a small number of individuals (6% of the participants) who underestimated their physical activity level. This finding implies that although a large majority of the at-risk population is not meeting the recommendations for physical activity, they are unaware of their risk and will likely do little to improve their situation (van Sluijs, et al., 2007). This may be an important factor to address in any intervention seeking to increase physical activity. People need to be educated so that they are aware of the current risks and the benefits of PA, and understand their own situation in relation to recommended physical activity levels.

Psychological influence. For many it is difficult to change current habits because they do not see or understand the consequence of their behavior. Evidence indicates that youth are unconcerned about over eating now and eat more than the required energy, without considering the potential dangers of acquiring excess weight and engaging in too little physical activity (Stice, Shaw, & Marti, 2006). Also, there are many psychological barriers to changing physical activity practices, such as the "lack of willpower" or feeling like one is "too busy" to think about health (Stice, et al., 2006).

Television. There has been much research that has explored the role parenting styles plays in television viewing and how it relates to physical activity practices. One such study

noted that there was a "weak positive association between parent-reported television time and objectively measured low physical activity (low PA) (r = 0.17) and a weak inverse association between television time and moderate-to-vigorous-intensity physical activity (MVPA)" (Hesketh, et al., 2006). The strongest predictors of children's television viewing patterns were the paternal and maternal education level. In all age groups, higher parental education was associated with less television viewing. Television viewing and low PA was generally more common for children in single-parent families (Hesketh, et al., 2006).

Television viewing may also have a strong influence on nutritional habits. In a study aimed at measuring the effect that television viewing has on diet patterns in children, it was found that the amount of television viewed in the home had a strong correlation with the types of foods that were most frequently consumed by the children (Coon, Goldberg, Rogers, & Tucker, 2001). These findings held true even after controlling for socioeconomic status and other covariates (Coon, et al., 2001). Though our particular study does not focus on the effect of diet, it is important to note the strong role television plays in the lives of those who view it frequently. Also, television viewing is primarily a sedentary leisure activity, which contributes to decreased physical activity. One study reported that though BMI was not correlated with physical activity level, it was associated with sedentary behavior such as television viewing (Springer, Kelder, & Hoelscher, 2006).

Influence of the family on physical activity levels. Obese parents tend to have obese children (Cutting, Fisher, Grimm-Thomas, & Birch, 1999). There are many factors that relate to weight gain that are strongly associated with family, such as genetics, diet, and lifestyle. In a cohort study researching early life determinants of physical activity, it was found that there were very few factors in early life that predicted physical activity later in life (Mattocks, et al., 2007).

In this study there were several characteristics of the child's family that were suspected of having an influence on the child's physical activity in later years. Some of these characteristics include the weight and activity level of the parents at the time of birth, socioeconomic status at the time of birth, parental marital status, breast feeding, season of birth, and others. Some association was found between maternal characteristics before birth, however, these associations were modest at best. None of the birth outcomes or childhood characteristics were associated with physical activity levels in later years (between the ages of 11 and 12) (Mattocks, et al., 2007). This study concluded that early life factors have limited influence on later physical activity in 11-12 year olds. The study also showed that children were active later in life when their parents were active, regardless of the early life characteristics. This indicates that targeting parental physical activity may be a beneficial way to influence physical activity in children, even if parents were not physically active earlier in the child's life (Mattocks, et al., 2007).

The presence of siblings is influential on the physical activity level of the children, especially for older and younger girls. Children with siblings spent more time in moderate-to-vigorous-intensity physical activity (MVPA) (Hesketh, et al., 2006). A study by Hesketh et al., (2006) reported that measures of family composition (number of parents in the home and presence of siblings) were more consistently related to children's physical activity than were the socioeconomic indicators.

In a meta-analysis of physical activity interventions, it was found that the greatest effect of interventions were seen in adolescents, rather than children or preadolescents (Stice, et al., 2006). It was suggested that this difference exists because adolescents are developing independence as well as establishing their own habits. However, in this same review it was found that the effect in children was greater when parents were involved in the intervention

(Stice, et al., 2006). Therefore, involving parents to influence adolescents' and children's behaviors may be a good strategy.

An eight-week intervention for weight loss was used to determine whether focusing an intervention for mothers could have an effect on their 1-to-3-year-old children (Klohe-Lehman, et al., 2007). This study was focused on overweight or obese women (BMI greater than 25). The main outcome measures were weight loss in mothers and improvement in nutrition and physical activity in mothers and their children. The women were brought to classes for eight weeks in order to be taught in areas of nutritious cooking and shopping, exercise and other healthy practices (Klohe-Lehman, et al., 2007). The results of the study showed that the intervention had an effect, not only on the mother's nutrition and physical activity, but the children were also affected by the intervention their mother's participated in. Even though this program was aimed at helping the mothers lose weight, it was also influential in the child's life and lifestyle (Klohe-Lehman, et al., 2007). This implies that teaching a parent can be a useful way to reach a child.

One study in adolescent girls assessed some of the environmental factors that may affect 6th grade girls' participation in vigorous physical activity (Springer, et al., 2006). The researchers reported weak correlations in all the measured influences, friend/social support or family support. The results showed that family influence had the strongest negative correlation with participation in sedentary leisure activities (i.e., television and video games) (Springer, et al., 2006). The developmental theory suggests that younger children are influenced more by their family practices, but as children age, the influence switches to peers. This theory was tested by Springer et al. and found only minimal support. Other studies have indicated continued parental influence in adolescents as well as children (Stice, et al., 2006).

De Marins et al. (2003) reviewed the associations between overweight children and overweight parents in Rio de Janeiro, Brazil. In their investigation they found that 20.7% of girls and 26.9% of boys were overweight. They further found that maternal BMI was a significant predictor of overweight children and adolescents. However, in this study paternal nutritional status was not found to be correlated with overweight children and adolescents (de Marins, et al., 2003).

Intervention Strategies

A large meta-analysis that explored physical activity interventions that work was conducted by Stice et al. (2006). This review included programs that targeted physical activity as well as other risk factors for cardiovascular disease. These were prevention programs aimed solely at reducing and preventing obesity or weight gain as well as interventions designed solely to increase physical activity, and programs to prevent eating disorders by promoting the use of healthy weight management skills. According to this review parental involvement leads to more favorable results in obesity prevention (Stice, et al., 2006). Also longer intervention programs produce superior effects compared to a brief intervention (Stice, et al., 2006).

Intervention through Religious Organizations (Faith-based Interventions)

Religious organizations have been a useful means for influencing change among their congregations (Campbell, et al.; DeHaven, Hunter, Wilder, Walton, & Berry, 2004). A large percentage of Americans have religious affiliations and attend church or other religious institutions, making the church-based setting ideal for reaching a large portion of the population (Campbell, et al.). Also, DeHaven et al. (2004) report, "…about 57% of all U.S. congregations participate in various social service delivery programs, including food and clothing, housing and homelessness, domestic violence, substance abuse, employment and health programs"

(DeHaven, et al., 2004). There have been several successful studies conducted within religious or faith-based organizations that have shown this to be an effective mode for presenting health education information (Campbell, et al., 1999; Campbell, et al., 2007; DeHaven, et al., 2004; Ken Resnicow, et al., 2002; K. Resnicow, et al., 2001; Strawbridge, et al., 1997; Whitt-Glover, Hogan, Lang, & Heil, 2008).

Using religious organizations is an effective strategy because it provides a strong social and cultural framework through which to provide education and encourage change (Campbell, et al., 2007). Also in a religious setting, there is social support that is not present in other spheres (Campbell, et al.). Another benefit of using religious organizations for engendering change is that it is often a more stable network where individuals will remain for many consecutive years, as opposed to the workplace or other social organizations which have become much less stable (Campbell, et al.). Another benefit of the church structure is that it provides access to individuals on a regular basis, since the members are accustomed to meeting regularly on specific days, particularly Sundays, and in some instances, other days throughout the week as well (Campbell, et al.). Also, many religious organizations already encourage their members to engage in good health practices; therefore, it is a natural progression for them to incorporate a health program (Campbell, et al., 2007). Public officials have come to recognize that often, church-based interventions have a deeper influence than federally administered programs and agencies (Campbell, et al.).

A study done by Strawbridge et al., (1997) observed the differences in mortality between those who attend religious services regularly and those who either do not attend, or attend infrequently. They found that regular religious activity in general seems to have an effect on the overall health of the individuals who participate in it. There may be several reasons for this

association between religious attendance and improved health. It is unclear whether the health benefits are caused by the psychological benefits of religious attendance, such as prayers or social connection, or a product of the positive influence on healthy behaviors common among religious organizations (Strawbridge, et al., 1997). For example, religiously strict individuals tend to have higher fruit and vegetable consumption, a greater likelihood of regular exercise, and in certain religions, abstaining from harmful substances such as alcohol. Those in stricter religions, (i.e., Seventh-Day Adventists, LDS, and Orthodox Jews) tend to live longer healthier lives than those who participate in less strict religions (Strawbridge, et al., 1997). Some of these "stricter" religions also have diet and lifestyle recommendations such as refraining from certain foods (pork) or alcohol (Strawbridge, et al., 1997).

One study also found that in Utah, the predominant religion (LDS) has a lower percentage of physically active than those of non-LDS faiths and those not affiliated with a religious denomination (Merrill & Thygerson, 2001). Therefore, there is a need for specific focus on physical activity within this population.

There have been several studies which use the African-American church population, or "Black churches" as their subject group (Campbell, et al., 1999; Campbell, et al.; K. Resnicow, et al., 2001). Since a majority of African Americans have religious ties, the church is one method that has been used to reach out to this population (Ken Resnicow, et al., 2002). This setting provides many advantages; not only does the church provide an excellent means for reaching a large group of individuals, but it also provides a cultural framework for the presentation of information concerning healthy eating and good lifestyle choices (Ken Resnicow, et al., 2002). In many populations of African Americans there is a feeling of distrust toward the public health system (Campbell, et al.). The church, on the other hand, is often considered the

most credible, respected and visible aspect of the community. Therefore, by partnering with Black Churches the health organization is able to appear with more credibility in the community (Campbell, et al.). This faith-based method for presenting ideas on health may be even more effective at producing lasting changes in individuals.

According to Whitt-Glover et al., (2008) faith-based interventions among blacks have been successful for smoking cessation, reducing cardiovascular disease risk factors and increasing fruit and vegetable consumption. In this pilot study the purpose was to evaluate and develop a faith-based PA program in order to increase participation in daily walking and moderate- and vigorous-intensity physical activity (Whitt-Glover, et al., 2008).

Pedometers

Our study will use pedometers as an objective method to assess the physical activity levels of the participants. Pedometers have been found to be a reliable method for objectively measuring the amount of movement a person engages in (Richardson, et al., 2007). In a pilot study, two strategies for increasing physical activity through pedometers were compared in individuals with type 2 diabetes (Richardson, et al., 2007). The most common strategy for pedometer interventions is to increase overall steps per day (Richardson, et al., 2007). This method has been effective in increasing overall steps, however it is uncertain whether the increased steps are associated with moderate-physical activity (Richardson, et al., 2007). It was uncertain whether a simple increase in daily steps was associated with an increase in physical activity intense enough to produce health benefits (Richardson, et al., 2007). This study evaluated the effectiveness of increasing steps only through bouts of exercise versus total daily steps. The result of this intervention was that both groups experienced a similar increase in steps (Richardson, et al., 2007). However, those in the total steps-per-day group had a much higher

satisfaction rating and were willing to wear their pedometer more often. Since both strategies have similar success rates in terms of increased steps, the two different methods may have the same health benefits but with increased satisfaction for those encouraged to increase total daily steps (Richardson, et al., 2007).

Chapter 3

Methods

The purpose of this study is to determine whether FHE lessons specifically written to improve physical activity habits can increase pedometer steps in both parents and children.

Subjects

Eighty Latter-day Saint families will be recruited through various means: flyers, word of mouth, and referral. In order to be included in the study each family must include both parents and at least two children between the ages of 6 and 16 living at home. They must also agree to hold regular FHE for six consecutive weeks.

Instruments and Measurement Methods

Volunteers will be randomly assigned into either the control or the intervention group. All participating families, in both groups, will be asked to complete a questionnaire for the purpose of determining age, gender, height, weight, etc. Physical activity will be assessed objectively using pedometers. Participants will be asked to wear a pedometer the week (seven days) before beginning the family home evening lessons, in order to measure base-line activity levels. They will be asked to wear pedometers again after the six-week intervention to assess whether changes in PA have occurred. Pedometer measurements will be reported through a log provided by the investigator. Attitudes toward physical activity will be measured pre-and post-intervention in order to assess the motivational value of the family home evening lessons.

Procedures

Participating families will be randomly assigned into one of two study groups, control or intervention. Both groups will be sent a link to a website. The intervention group will be provided with a website containing the six lesson plans designed to improve PA levels, to be

used in their FHE program. The control group will receive a link to a website containing six lessons on normal religious topics, taken from the Family Home Evening Manual and other resources provided by The Church of Jesus Christ of Latter-day Saints. The control lessons will be chosen specifically to avoid topics that may affect physical activity behaviors.

Six intervention lesson plans for FHE will be designed to introduce simple principles of health and physical activity and present families with ideas for incorporating more physical activity into their daily lives. The intervention lessons will illustrate how important it is to take care of the body from both temporal and spiritual perspectives. Scripture, modern revelation and other resources will be used to enhance the lesson content. The lesson outline will also encourage the family to review their current activity habits and discuss ways to improve levels of physical activity as a family, and individually. Families will be encouraged to discuss and set realistic goals and work together to achieve them. At the beginning of each lesson (beginning the 2nd week) the family will be asked to review the progress that was made the previous week and find ways to improve in specific areas. All six lessons follow a similar pattern with a check-up (after the first week), material, discussion questions, goal setting time, as well as ideas for activities and (healthy) treats.

The intervention lessons will also encourage families to plan activities that are enjoyable and active in nature that all members of the family can participate in. These activities will include ideas such as playing a game or going for a walk together, which would help to incorporate more exercise into family interactions, as well as providing healthy recreational opportunities.

Both sets of lessons will be delivered via the internet. Families will be asked to teach the lessons in order, one per week, for six consecutive weeks.

Before the intervention begins, an orientation meeting will be held in order to familiarize participants with the procedures of the project and distribute pedometers. During the orientation meeting participants will be instructed regarding the use of pedometers, including how, when and where they are to be worn. Those not able to attend will have pedometers taken to them, and will receive individual instruction.

The participants will be informed that they will be receiving six lessons plans through a web page designed for the project. The participants will not be told whether they are the control group or the intervention group. Participating families will be asked not to discuss the lesson content with other families that they may know who are also participating in the project.

This study is unique in several ways. It uses a family intervention, it uses a faith-based intervention, and it is self-administered rather than being delivered by a proctor or other instructor supervision.

Design and Statistical Analysis

All families will be asked to thoughtfully study the information provided and apply it to their own family's circumstances. Each week the families will receive an email asking them whether or not they were able to hold FHE that week, and approximately what percent of the lesson material was covered. Both groups will be asked to wear pedometers the week prior to the first lesson and the week following the sixth lesson. They will also be asked to complete a survey about attitudes toward physical activity, and provide demographic information for participating family members.

Permission will be obtained from the University IRB, and all adult participants will be asked to sign consent forms for themselves and parents will be asked to sign for their children.

The intervention period will be six consecutive weeks and the study period will be eight weeks (one pretest week, six weeks of intervention, and one posttest week). The posttest week will be included in the final intervention week). If a lesson is missed the family will be instructed to make it up the next week. Only data from families who have completed four of the six weeks will be included in the analysis. After completion of the study, families in the control group will also be offered the FHE lessons on physical activity.

A two (group) by two (trial) ANOVA will be used to determine differences in PA from pre- to posttest in families and between control and intervention groups. SPSS will be used for all statistical analyses.

Weaknesses

One weakness of this study is that this approach has low generalizability to the national population. It would however, be generalizable to members of the LDS church living in Utah, who hold regular FHE.

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Appendix B
Intervention Lessons

Lesson 1

Why is it Important to Care for our Physical Bodies?

Material

Scripture and thought questions

Have a family member read 1 Corinthians 3:16–17.

16. Know ye not that ye are the temple of God, and that the Spirit of God dwelleth in you?

17. If any man defile the temple of God, him shall God destroy; for the temple of God is holy, which temple ye are.

Discuss the temples you have seen. Think about how temples look. What are some of the similarities between each temple? What are some differences between them? (You may want to show pictures of some temples)

Even though no two are exactly the same, all temples are well cared for and beautiful in their own way. The same is true of our personal temples. None of us are exactly the same; we are all unique. It is important that we take care of what we have been given and make it the best it can be.

"The healthy man, who takes care of his physical being, has strength and vitality; his temple is a fit place for his spirit to reside. ... It is necessary, therefore, to care for our physical bodies, and observe the laws of physical health and happiness." David O. McKay, "The Whole Man," *Era,* vol. 55 (April 1952), p. 221.

Discuss some ways that we can care for our physical bodies

What is Health?

Read and discuss the definitions below for the following words: Health, Physical Activity, Exercise, and Physical Fitness.

Health can be defined in several ways. The definition approved by the World Health Assembly in 1948 declares: "**Health** is a state of physical, mental and social well-being. It involves more than just the absence of disease or infirmity." Most definitions agree that there are several interconnected aspects of health including physical health, emotional health, and spiritual health. This can be compared to a three legged stool; when one of the legs is too short or too long the whole stool is unstable.

Physical activity generally refers to any activity that requires large muscle movement for an extended period of time. This includes normal daily activity such as climbing the stairs or walking to the mailbox.

Physical fitness is the ability to work and or play for a long period of time without physical fatigue. The body adapts to physical activity by becoming more physically fit. So, the more you move the longer you can go without becoming tired.

Exercise is a specific form of physical activity that is planned and structured. Not all physical activity is considered exercise. Many people change clothes and set time aside to exercise, whereas physical activity is generally unscheduled as mentioned earlier. Exercise is a good way to get needed physical activity, which can also increase physical fitness.

Discuss how these definitions apply to your family. For example:

What do you do in your day that would be considered physical activity? And exercise?

What kinds of physical activity and exercise do you enjoy?

Do you consider yourselves to be physically fit?

Are there some aspects of health that you feel are more important or more influential than others?

How are each of the different components of health interrelated? How do physical activity and physical fitness relate to spiritual health?

Consider your current health status individually and as a family. Are there areas that you know you would like to improve? What specific things can you start doing today that will help in this/these area(s)?

Goals

Have each family member write or share a specific goal that they would like to accomplish this week in relation to health, physical activity or exercise. Be sure that these goals are realistic and measurable and specific. For example: “get active” or “lose weight” are good long term goals but they are not specific. A more useful goal would be: “walk for 20 minutes two times this week,” or “take the stairs instead of the elevator this every day this week”. This kind of goal can be measured, it is realistic, and it is specific.

As a family, plan to report on your success (and possible difficulties) with the goals you set. Work together and encourage all family members to participate.

Activity

(see "ideas for activities")

Treat

(see "ideas for healthy treats")

Lesson 2

What can exercise do for our family?

Check-up

Before beginning this lesson please review together some of the ideas from last weeks lesson about health and physical activity.

Discuss your individual goals and successes in achieving them. Also discuss what areas were difficult and how they may be overcome in the future.

Material

In Lesson 1 you learned about the spiritual, mental and physical aspects of exercise. Regular physical activity or exercise has been associated with reduced risk of heart disease, diabetes, cancer, and other chronic diseases.

Our bodies seem to be made to work. In Moses 4: 25 we are told that Adam was destined to receive his food by "the sweat of his brow". Up until the last several decades, strenuous physical activity was required in order to eat, acquire shelter, travel, and communicate. In today's world there are so many labor-saving devices available that very little energy is required of us to perform these same tasks. If individuals do not engage in physical activity in their leisure time, they will generally not get enough physical activity to keep their body functioning in top condition. This lack of physical activity, in turn, could lead to chronic illnesses such as heart disease, obesity, diabetes and some forms of cancer. The risk of these chronic diseases can be significantly reduced by engaging in physical activity for as little as 30 minutes a day, five days a week.

Physical fitness is not the same as exercise (see lesson 1) but physical fitness is also an important factor in increasing health. The more physically fit a person is, the lower

their risk of health complications. Exercise is a good way to become physically fit and maintain that fitness level.

Many of the effects of exercise are long-term. Thus it is difficult to see immediate results. Because of the long-term nature of the benefits of exercise many people struggle to find motivation for daily exercise. Much like faith, we must "...hope for things which are not seen, which are true." (Alma 32:21) We know they are true because they have been studied extensively for several years. It is important to incorporate physical activity into your lifestyle in fun, diverse ways in order to keep physical activity enjoyable (More ideas on this topic will be addressed in lesson 5).

Here are some questions to consider and discuss:

Reflect on a time when you were physically fit. How did you feel? Are you physically fit right now?

How do you feel when you exercise regularly?

Think of someone you know who has been physically active their whole lives and is now aging. Does their lifestyle seem to make a difference in the kind of life they enjoy? Think of someone who has not taken care of themselves and the life it lead to. (i.e. President Gordon B. Hinckley had a regular exercise program and took care of himself in other ways as well. He lived to be 89 and had a long, healthy and independent life.)

Do you believe that the benefits of exercise are worth the effort? Why or why not?

What can you do to increase your physical fitness and physical activity?

Goals:

Have each person write or share a specific exercise goal that they would like to accomplish this week (a different goal than last week). You may also wish to make family goals. Remember that goals are most effective when they are realistic, measurable, specific and recorded.

Activity

(see suggestions for more ideas)

Treat

(link to healthy treat ideas)

Lesson 3

What can exercise do for our family?

Check-up

Before beginning this lesson please review together some of the ideas from last weeks lesson about health and physical activity.

Discuss your individual goals and successes in achieving them. Also discuss what areas were difficult and how they may be overcome in the future.

Material

In Lesson 1 you learned about the spiritual, mental and physical aspects of exercise. Regular physical activity or exercise has been associated with reduced risk of heart disease, diabetes, cancer, and other chronic diseases.

Our bodies seem to be made to work. In Moses 4: 25 we are told that Adam was destined to receive his food by “the sweat of his brow”. Up until the last several decades, strenuous physical activity was required in order to eat, acquire shelter, travel, and communicate. In today’s world there are so many labor-saving devices available that very little energy is required of us to perform these same tasks. If individuals do not engage in physical activity in their leisure time, they will generally not get enough physical activity to keep their body functioning in top condition. This lack of physical activity, in turn, could lead to chronic illnesses such as heart disease, obesity, diabetes and some forms of cancer. The risk of these chronic diseases can be significantly reduced by engaging in physical activity for as little as 30 minutes a day, five days a week.

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How do you feel when you exercise regularly?

Think of someone you know who has been physically active their whole lives and is now aging. Does their lifestyle seem to make a difference in the kind of life they enjoy? Think of someone who has not taken care of themselves and the life it lead to. (i.e. President Gordon B. Hinckley had a regular exercise program and took care of himself in other ways as well. He lived to be 89 and had a long, healthy and independent life.)

Do you believe that the benefits of exercise are worth the effort? Why or why not?

What can you do to increase your physical fitness and physical activity?

Goals:

Have each person write or share a specific exercise goal that they would like to accomplish this week (a different goal than last week). You may also wish to make family goals. Remember that goals are most effective when they are realistic, measurable, specific and recorded.

Activity

(see suggestions for more ideas)

Treat

(link to healthy treat ideas)

Lesson 4

What kind of exercise should I do and how much?

Check Up

Before beginning the lesson review as a family the key points from last week's lesson. Discuss your individual goals and any successes that have experienced. Also discuss what areas were difficult and how they may be improved in the future.

Awareness activity:

Have each member of the family calculate the amount of time spent watching TV, playing video games, or participating in other similar non physical leisure time activities

in an average day. Calculate how many hours that adds up to in an average week. Then discuss that only about 2 hours per week (30 min four days) is needed to be physically fit. Most of us have the time for exercise; we just choose to use it in other ways.

Material

Often when people begin new things, they have a great deal of motivation and desire to start big. However, it is better to take steps that are realistic and can be maintained, even if they seem small to begin with. Remember what Mosiah taught, "And see that all these things are done in wisdom and order: for it is not requisite that a man should run faster than he has strength. And again, it is expedient that he should be diligent, that thereby he might win the prize; therefore, all things must be done in order." (Mosiah 4:27)

Injury from physical activity can occur when the activity is more intense than the body is accustomed to. Many people become discouraged when beginning a new exercise program that is too advanced for them. Their discouragement may be in part due to injury (pain) or discomfort involved in adopting more physical activity. The body will adapt to increased physical activity by strengthening the heart, lungs and other muscles. When an exercise program is begun gradually, this adaptation has time to take place without causing injury.

There are three components to a proper exercise program: frequency, duration and intensity.

Frequency refers to how often one exercises. (i.e. two or three times per week)

Duration refers to how long each session of exercise lasts. (i.e. 20 to 30 minutes)

Intensity refers to how strenuous each session of exercise is. (i.e. low, moderate or high).

When beginning a new exercise program it is a good idea to keep the duration and intensity low while increasing the frequency. In other words, begin with a high frequency of low intensity activities that are short in duration. Once the frequency is increased to a level that is comfortable (preferably most days of the week, but one day is better than nothing) then the duration may be increased. After a comfortable duration is reached, intensity can be increased. Keep in mind that the benefits of an active lifestyle can be achieved by 30 minutes per day of moderate-intensity physical activity most days of the week.

The easiest way to determine the intensity of an activity is to pay attention to your breathing. A moderate intensity activity will cause you to breathe harder while still being able to carry on a conversation. If you are not breathing hard at all, you probably are working at a low intensity. If you struggle to breath and cannot carry on a

conversation while exercising then it is a high intensity activity. As with frequency and duration, intensity should be gradually increased. For younger individuals walking may not be intense enough. Most children and young adults do not gain the same benefits from walking that older adults do. The younger group usually requires more intensity (i.e. running).

Here are some questions to consider and discuss:

Why is it important to increase physical activity gradually?

What would physical injury impact a person's physical activity routine? (Does someone in the family have personal experience with this concept?)

Discuss as a family how you can follow this pattern of gradually increasing frequency, duration and intensity. Make a specific plan of how you will implement these changes.

You might not notice big differences at first but remember what Alma taught us about the little things.

"Now ye may suppose that this is foolishness in me; but behold I say unto you, that by small and simple things are great things brought to pass; and small means in many instances doth confound the wise." (Alma 37:6) So, even though we are beginning with small changes, it is by doing the small and simple things that we are able to accomplish great things.

Ideas and examples for starting gradually:

Take a short walk at lunch time

Park at the end of the parking lot and walk

Take the stairs instead of the elevator

Walk to church (if possible)

Limit video and television viewing (and substitute a physical activity)

Couch to 5K (actually more of a walk/jog program than a running program!)

http://www.coolrunning.com/engine/2/2_3/181.shtml

Pedometers can be an effective tool to motivate you and your family to be more physically active. Find ways to take more steps: walk to the neighbors instead of calling, park at the edge of the parking lot and walk to the door, go for a walk, take the stairs instead of the elevator, and so on. As a family you can pick a goal of total steps for each

day, week or month. The daily recommendation for physical activity is the equivalent of about ten thousand steps per day.

Goals:

Have each person write or share a specific goal that they would like to accomplish this week. You may also wish to make family goals. Remember that goals are most effective when they are realistic, specific and measurable.

Activity

(see webpage for more ideas)

Treat

(see webpage for healthy treat ideas)

Lesson 5

How long do I have to continue exercising?

Check up

How are you doing with your exercise program? Discuss strengths of your efforts. Where are you seeing success? What strategies are working well for you? What can you do to help yourself and each other make long term changes? Do you feel more knowledgeable about what kind of exercise you need?

Material

If you want the continued benefits of physical activity, you must remain physically active. A better question than "how long do I have to exercise?" would be, "How long do I want the health benefits of exercise?" Once you know the answer to the second question, you will have the answer for the first. Concentrate on making permanent changes in your physical activity. This is why it is so important that your goals are realistic. Otherwise you will burn out and go back to old habits. Remember the scripture from lesson 4 "And see that all these things are done in wisdom and order: for it is not requisite that a man should run faster than he has strength. And again, it is expedient that he should be diligent, that thereby he might win the prize; therefore, all

things must be done in order." (Mosiah 4:27) As we talked about in Lesson 4, it is important to keep a realistic pace and be diligent in striving for continual progress.

Consider the task of pulling a wagon up a hill. As long as you continue to pull, the wagon will continue to make progress toward the top of the hill. However, if you stop pulling or let go, then the wagon moves quickly down the hill. Just like pulling a wagon up a hill, if you are working on incorporating physical activity into your lifestyle, you will move forward toward increased health benefits. However, as soon as you stop your regular exercise you will begin to lose the benefits of your previous efforts.

The only known negative effect of regular exercise is injury resulting from overexertion or accidents. On the other hand, the benefits of physical activity are numerous and span several areas of health, including mental health, emotional health, spiritual health, and physical health (as mentioned in previous lessons). Even if you are unable to exercise as much as you would like, remember that some exercise is always better than no exercise.

In time, you may begin to think of exercising as a chore, but it does not have to be that way. Remember to keep it fun and to vary your exercises to reduce boredom.

Here are some ideas for keeping exercise fun, just to get you started:

Dance to music

Jump rope

Dance Dance Revolution, Wii, or other active video games

Play basketball, Frisbee or other sports with the family

Play tag

Work in the garden

Mow the lawn (with a push mower☺)

Go for a family bike ride

Links to more ideas:

http://www.kidnetic.com/

http://www.kidnetic.com/WetHead/index.aspx Ideas for kids games

Centers for Disease Control and Prevention, Physical Activity for Everyone

http://www.cdc.gov/nccdphp/dnpa/physical/everyone/index.htm

Tips for getting your Kids off the Couch: Mayo Clinic

http://www.mayoclinic.com/health/fitness/FL00030

10 Tips to get your Kids moving: Time Magazine

http://www.time.com/time/magazine/article/0,9171,1813963,00.html

As a family, discuss some creative methods for fun physical activity. Discuss goals for implementing some of these ideas.

Keep in mind that even small increases in physical activity can bring significant health benefits, especially for those who were previously physically inactive (sedentary). Some people where were previously sedentary may need to consult with a doctor before increasing (see PARQ)

Once you reach the level of 30 minutes per day on most days of the week, you are already exercising enough to enjoy most of the health benefits available through from being physically active. Even if you have not yet reached 30 minutes a day on most days of the week, you are still experiencing a reduced risk of health problems if you have increased your level of physical activity.

Goals:

Have each person write or share a specific goal that they would like to accomplish this week. You may also wish to make family goals. Remember that goals are most effective when they are realistic, specific and measurable.

Activity

(see suggestions for more ideas)

Treat

(link to healthy treat ideas)

Lesson 6

How to deal with set-backs

Check Up

Discuss what your family has learned during the past five weeks. What significant changes have you noticed in your lives as you have been more physically active?

Material

The effects of physical activity are mostly long term. Therefore, it may be difficult to know if you are making progress with your goals. Without immediate feedback, it may be harder to find motivation to continue in your efforts. Remember that the body is complex and though you may not detect the improvement (or even a noticeable difference), you are certainly benefiting from your increased levels of physical activity. There is robust evidence which indicates that there is a strong relationship between physical activity and increased health. Pay attention to the things you do notice such as increased confidence, improved mood, and other short term benefits. You may be surprised at how quickly these areas are affected.

You may be thinking that you are healthy enough to not worry about changing your lifestyle. For this type of individual, it is important to realize that, not all changes in the body are visible. Most chronic illnesses can go unnoticed until it is almost too late. Heart attacks, for example, are often sudden and unexpected. However, they are usually the result of years of unhealthy living.

Set-backs are normal and are part of the process of change. Use these set-backs as tools to help you restart in a way that will work better for you. The habits you now have are a result of years of practice, which will not be changed overnight. Just as you committed years to becoming what you are now, you will have to devote time to making these healthy changes. Making lifestyle changes is a constant effort, similar to living the gospel. “Fight the good fight of faith, lay hold on eternal life...” (1 Timothy 6: 12) Even though we cannot see eternal life we are motivated by our faith in it to continue to fight toward that goal. This concept can be applied to making lifestyle changes because we cannot see the end result, but we must be able to fight for it anyway. Making a mistake does not mean that you are a lost cause; it simply means you have room to improve. Little is accomplished by dwelling on failures. It is far better to make efforts to move forward, learning from the past.

You may lose a battle here and there, but the important thing is that you continue to work toward improved health. If you do stop exercising for a long period of time you will need to work up to the level you were at before you stopped. If you try to start at the level you left off on, you may experience injury which would make it difficult to maintain regular exercise.

Remember that our Heavenly Father is interested in our personal health and the health of our families. You can call upon Him for help in overcoming challenges, whether they are in schedules, motivation, or other areas.

The family can also be an excellent source of mutual support and encouragement. Make an effort to be interested in each others' goals and struggles. Help each other find ways to overcome obstacles and share your excitement for each other when one of you achieves your goals. Studies have shown that children are more influenced by the activity behavior of their parents than they are by what they learn in school or other settings. You can be an example of someone who is working to improve his/her lifestyle. When setbacks occur, the family can work together to overcome them without letting discouragement set in.

Here are some questions to consider and discuss:

Why are setbacks so dangerous to achieving our goals?

What personally motivates you to continue to change?

How can your family be a strength against setbacks?

Do you believe that the health benefits you will gain will be worth all the effort you will expend?

Review:

As a family and individually review the things you have learned the past few weeks. Discuss what worked for your family and what did not. What have you changed? What would you still like to work on? What were your favorite parts of the lessons? What were the most difficult areas for you? What will you do in the future to improve in these areas? Make plans to continue improving your lifestyle.

Goals:

Have each person write or share a specific goal that they would like to accomplish this week. You may also wish to make family goals. Remember that goals are most effective when they are realistic, specific and measurable. Also, make long term goals that will help you to form long term habits.

Activity

(see suggestions for more ideas)

Treat

(link to healthy treat ideas)

Appendix C
Comments

Comments from Parents

Note: Of the 60 adults in the intervention group there were 55 (male=22) that responded to the questionnaire given at the end of the intervention. These are the comments they made, in no particular order.

Some info from the lessons was useful.

It made me want to be more consistent but it highly influenced my boys.

We are already a pretty highly active family, but I have made more time for myself to get better fitness.

I have been working on my fitness for quite some time and this encouraged me to continue my efforts.

The lessons seemed to repeat a lot of the same information.

lessons very repetitive

we're active anyway--pedometers weren't great for measuring running activity. Walking gives you more steps than running!

It seems as if this was a short term intervention that will have short term effects. Over time, I wonder if I will remember the lessons or whether my fitness level will sustain and short term changes.
FHE lessons were stopped after 3rd lesson because they were so redundant

The lessons used to complex of sentence structure for a young kid. Had to shorten sentences to make it sound more conversational and less like a textbook.

I had actually started an exercise program two months prior to starting this study - so it just enhanced what I had already started.

The pedometer really inspired my 13 year old son. My 17 year old daughter was cooperative but unchanged.

6 weeks was too many lessons. They got tired of hearing about it and I don't think it really changed their habits.

The lessons were quite repetitive in some aspects, so it was sometimes a challenge to repeat them week after week. The topics were good, and the information was relevant, but the lessons would have benefited from a broader scope.

I felt the lessons should include a little about nutrition. I also noticed that my husband had little respect for the active life style portion. It was like he didn't even hear it, he has been so preprogrammed about aerobic exercise. I think you should repeat the encouragement to get at least 10,000 steps most days, more often. Perhaps there is a range according to age? In a future FHE setting I would have an active lifestyle lesson once every other month, so the family didn't burn out. But I can see why this wouldn't work in a study situation. Wearing a pedometer was novel so my family liked it. Writing down the numbers and knowing that someone else, family members and study leaders, would see them was effective motivation.

Our kids are very active, and hear from me all the time about the benefits of staying active. They said they didn't learn anything new, but reinforcement is always good.

too many lessons that seemed to be similar message.

I think that after a few lessons my children were bored, it seemed a lot of the same information over and over. I think the pedometers worked great for my family.

The only thing I notice it was very hard to keep the children focus, specially the young ones.

Some of the information in the lessons was educational for my children.

I have pretty active children already - it was fun to actually be able to chart it. (P.S. I have two 10 year olds - only one box to check)

Pedometers are not an accurate enough instrument in measuring physical activity for a before and after comparison. The pedometer has a large margin of error, in our case at least 25%. This error is large enough to hide any change in physical activity that we may have had. /

I heard it all before! For me personally making the changes is difficult. The lessons are a good way to help different ages learn

ideas to consider in editing the lessons: Could provide a sheet for writing goals. Would be more likely that people would then actually write down a realistic, specific and measurable goal. could provide a sheet for writing down the various physical activities a person does each day. Some people will be influenced to try more things if they are keeping track of the different sports they do each day. Provide art work to go with the lessons. We did our own artwork to keep some of the kids listening. For instance they drew stools and labeled the legs for the areas of health. Use bullet points instead of long drawn-out sentences in paragraph form. Or use a kid-friendly conversational style, not textbook. It was boring that way. Use stories of real people that are not necessarily in the scriptures. Human-interest testimonials. Or suggest that the parent tell their own stories about someone they know who exercises a lot and has energy and vitality--or about a fat uncle who eats poorly, sits on the couch all day and is going in for another heart surgery. Stories about friends and relatives who the kids actually know might be good in addition to or instead of the scripture stories. It was fun. Thanks for including our family. Good luck with the project.

timing of pedometer usage wasn't consistent. 1st week was during school - 2nd week was during summer. Totally different schedules. Not a great comparison.

I felt the lessons were a good way to approach the subject and did allow for conversation as a family. Using the pedometers was great along with the lessons, and gave us an idea of what we are doing during the day.

My kids felt like it was too repetitive. It was hard for them to keep wanting to talk about basically the same topic for six weeks in a row.

I feel like the lessons were very basic. They were great for a family that needs to be introduced to a good health/fitness program for life. We, as a family, already knew most of it; but it was a great reminder and it did cause us to set more goals than we would had we not been doing the lessons and using the pedometers. Thanks for letting us be involved! I think it's a great way to introduce health and fitness!

The last half of the lessons seemed too repetitive so we were all losing interest in them. We are already a fairly active family so overall we didn't need the information given. It could be beneficial to a family who wasn't already active though.

I did like the opportunity to set goals at the end of each lesson. We really got into that. The pedometers were the best part probably because they would compete against each other. We're a fairly active family who already believes in exercising and in physical exercise so most of the information was not new to us.

I think it is important to learn about physical fitness, but having 6 weeks of FHE lessons back to back was overkill. We like to focus on spiritual things in FHE and this was so much on the physical that I felt we were neglecting the real purpose of FHE. We would discuss the physical fitness lesson and then we would have our regular FHE lesson. I also looked in the FHE resource manual and could only find supplementary information in back about physical fitness. I'm not sure it's accurate to say these lessons come from the FHE resource manual because I don't think they do. When it comes to increasing physical activity, I think you just have to do it. It's all stuff we've heard before...it's just deciding you want to apply it. And even when you do decide you want to apply it, sometimes what works for one person will be different than what works for someone else. There are just so many things that affect physical activity levels....it's hard to simplify it to just knowing about it = doing it.

I thought the lessons were very good. They were well thought out and well put together.
6 lessons was too many. The lessons repeated too much.

The only negative feeling I had about the FHE lessons, were that they tended to be redundant. I found myself getting tired of them by the end.

Having served in many significant leadership positions in the church [The Church of Jesus Christ of Latter-day Saints], I feel this would be very beneficial to the members of the church primarily here in the US. I hope this happens and blesses the lives of the members

FHE lessons became redundant after first 2 lessons. I would have liked more areas of focus (aging, disease, body development, being born handicapped, using our talents, using our strength to serve the Lord, etc)or consolidate 6 lessons to 2 lessons. We actually quit giving these lessons after lesson #4- too repetitive.

After the first couple of lessons it seemed that the lessons just repeated themselves without a lot of new information. My kids just kept saying we know, we know we talked about almost the same thing last time. I did like the opportunity to set goals at the end of each lesson. We really got into that. The pedometers were the best part probably because they would compete against each other. We're a fairly active family who already believes in exercising and in physical exercise so most of the information was not new to us.

I thought the lessons were very good. They were well thought out and well put together. However, I wonder if such a short term intervention will have a long term affect on fitness. I doubt it. Perhaps a once a month year long series of lessons would have a more lasting affect. Additionally, I'm not sure the pedometers were a good measure of physical activity. On my second week of monitoring I spent more time lifting weights than I did running or walking and that was not captured by the pedometer giving the impression that my physical activity decreased. Moreover, one of my goals was to walk the stairs more at work. The pedometer captured each step as one pace, but did not account for the fact that those steps were more difficult and required more effort. Not all steps should be counted as equal. Another variable that should be considered is the fact that the study period crossed the end of the school year. During the second evaluation week our children were out of school and spent several days at the swimming pool. Exchanging school recess for swimming gives the impression that their physical activity decreased which is not an accurate measure.

I really liked doing this project. My girls liked it too at the beginning. It might be better if the lessons were spaced apart a little. Thanks for the opportunity.

Lessons were too repetitive. Either consolidate lessons (teach fewer) or introduce more concepts (expand content).

We just felt the lessons needed to be more actively engaging rather than a sit down listen lesson.

I really enjoyed the family home evenings and thought they were informative and motivational. The pedometer was a good motivator. Summer is a challenging time for me to do exercise. I am often busy in the yard and think of that my exercise.

I would be interested in the results you gathered.

Appendix D
Data

Adult Data

NAME	FAMILY_#	GROUP	TREAT	AGE	GENDER	PRE_STEP	POS_STEP
Rex	1	1	1	38	1	2205.67	2463.00
Greg	2	1	1	45	1	6685.67	8102.00
Greg	4	1	1		1	7705.83	7054.17
Mike	5	1	1	34	1	6440.40	8963.50
Mike	6	1	1	47	1	4569.17	7039.17
Hal	10	1	1	50	1	8597.80	11537.00
Glen	11	1	1	43	1	9287.33	14357.83
Mike	13	1	1	52	1	6160.33	5240.00
Dean	14	1	1	41	1	4811.33	5995.00
Stuart	15	1	1	53	1	5120.00	5492.33
Frank	16	2	1	42	1	6685.33	7291.67
David	17	2	1	45	1	12581.67	7843.67
Boyd	19	2	1	42	1	10515.83	11683.00
Kala	20	2	1	43	1	19603.17	19838.33
Joseph	23	2	1	47	1	12264.50	24741.83
Marco	27	2	1	46	1	6170.67	11265.83
Tom	34	3	1		1	12171.50	10331.00
Robert	35	3	1		1	4575.33	5054.17
Paul	37	2	1		1	7469.33	9487.17
John	38	2	1	46	1	6153.50	7436.83
Evan	43	3	1	48	1	5641.33	4995.83
John	45	4	1	38	1	7234.80	5400.67
Robert	60	4	1		1	7684.00	11701.67
Kevin	61	4	1		1	14031.33	11674.17
Blake	66	4	1	40	1	3567.17	4022.00
Kim	67	4	1	39	1	11505.20	11482.60
Steve	71	4	1	47	1	11101.67	9365.17
Rick	77	5	1	36	1	8915.33	7379.67
Jay	79	5	1	46	1	5989.50	8009.67
Jim	83	5	1		1	12021.17	14183.50
Heather	1	1	1	36	2	6173.50	5769.83
Carole	2	1	1	38	2	5423.60	6357.33
Toni	4	1	1	36	2	5073.50	7833.33
Lisa	5	1	1	33	2	10370.60	14533.17
Laura	6	1	1	44	2	5128.00	5841.17
Kathleen	10	1	1	49	2	11850.50	13448.83
Christine	11	1	1	39	2	11906.33	15650.17
Tracie	13	1	1	51	2	9057.17	9686.50
Kerry	14	1	1	38	2	3323.83	4927.50
Elva	15	1	1	49	2	3659.67	3946.17
Michelle	16	2	1	39	2	7572.67	9654.00
Joan	17	2	1	50	2	4257.33	9400.50
Tamela	19	2	1	40	2	13328.00	13185.17
Melanie	20	2	1	44	2	12247.50	17506.50
Sally	27	2	1	46	2	6067.33	3563.83
Jeanie	34	3	1		2	7805.67	7881.50

Wynlee	35	3	1		2	13971.67	10606.33
Carolene	37	2	1		2	8792.50	9459.50
Wendi	38	2	1	44	2	10330.67	11852.67
Penny	43	3	1	47	2	12122.83	10075.67
Saria	45	4	1	36	2	21742.50	12593.80
Kim	57	4	1	38	2	6685.00	12242.50
Tami	60	4	1		2	11228.17	14257.33
Catherine	61	4	1		2	8815.33	12413.33
Lana	66	4	1	42	2	9313.17	11480.17
Michelle	67	4	1	36	2	16439.33	18011.33
Jeni	71	4	1	45	2	10709.67	10299.83
Jenene	77	5	1	35	2	9261.83	11064.17
Kim	79	5	1	36	2	7926.50	10400.33
Michele	83	5	1		2	11359.83	13469.17
David	70	4	2	40	1	5330.83	8785.50
Kirk	7	1	2	39	1	5333.83	15127.50
Rusty	9	1	2	37	1	11375.33	13224.40
mother	12	1	2		1	11164.33	9267.50
Dave	21	2	2	44	1	14332.17	6865.33
Bryan	26	2	2	33	1	11812.83	16438.67
Jerry	30	3	2	57	1	10215.00	8001.83
Rick	39	2	2	36	1	5078.17	4992.20
Matt	51	4	2	36	1	12156.00	11987.83
Todd	52	4	2	41	1	9281.67	5376.67
Brandon	56	4	2	31	1	10895.33	9177.17
Randy	58	4	2		1	7630.00	7887.33
Bill	63	5	2	36	1	5634.33	9033.67
Parent 1	68	4	2		1	10121.67	7376.00
Dave	72	4	2		1	7748.00	7607.33
Dad	74	5	2	52	1	5495.83	6087.50
Darin	75	5	2	44	1	8013.17	13111.80
Ray	78	5	2		1	7673.50	6707.17
Russell	82	4	2		1	10625.40	9822.17
Kelly	70	4	2	39	2	10374.67	11068.17
Jill	3	1	2	40	2	9786.80	8417.83
Jen	7	1	2	35	2	5526.33	6443.00
Dana	9	1	2	33	2	5657.17	5110.60
father	12	1	2		2	9103.67	8420.67
Cindy	18	2	2	48	2	5779.20	4553.67
Kayleen	21	2	2	41	2	6836.17	10528.17
mother	22	2	2		2	7416.00	7534.50
Emily	26	2	2	32	2	12258.83	13033.67
Natalie	30	3	2	47	2	12163.33	11158.67
Amy	39	2	2	32	2	5044.40	4997.40
Jill	51	4	2	35	2	16516.33	19088.33
Rachel	52	4	2	41	2	6933.17	4517.50
April	53	4	2	37	2	7572.80	6216.20
Lori	55	4	2	41	2	9616.00	9333.17
Christy	56	4	2	31	2	9081.83	9501.33

Susan	58	4	2		2	10249.50	10375.33
Tami	59	5	2	39	2	4279.50	3333.40
Cathy	63	5	2	41	2	10039.83	10909.50
Connie	68	4	2	33	2	12460.50	11448.83
Dianne	72	4	2		2	8085.00	6376.17
Mom	74	5	2	47	2	14293.83	14521.00
Shauna	75	5	2	46	2	10085.50	10257.17
Annette	78	5	2	46	2	8715.17	7818.33
Marlo	82	4	2		2	7559.33	9510.67

Child Data

NAME	FAMILY_#	GROUP	TREAT	AGE	GENDER	PRE_ST	POS_ST
Steven	2	1	1	16	1	17341.00	19218.50
Clayton	2	1	1	10	1	14221.17	15967.90
Skyler	4	1	1	11	1	12717.40	16470.60
Devan	10	1	1	13	1	14332.10	17533.80
Tanner	11	1	1	11	1	13692.00	15670.40
Zac	13	1	1	14	1	9408.90	13609.40
Trey	14	1	1	7	1	23885.50	22614.00
Benson	19	2	1	15	1	15942.00	18921.90
Tyler	19	2	1	9	1	10327.60	11435.38
Kai	20	2	1	12	1	21215.70	22394.80
Tyler	34	3	1	14	1	8706.80	8535.40
Parker	37	2	1	14	1	12652.70	14381.90
Nathan	38	2	1	11	1	12067.10	10600.50
Micah	66	4	1	8	1	17243.90	16239.70
Kaleb	67	4	1	6	1	16662.50	14131.38
Cam	71	4	1	14	1	10131.10	9763.20
Dallen	71	4	1	7	1	11566.63	12497.20
Mike	77	5	1	7	1	8850.30	12114.50
Jonas	79	5	1	12	1	13622.70	13431.60
Nicole	6	1	1	16	2	7250.80	8017.60
Savannah	6	1	1	13	2	9297.00	9409.00
Heather	6	1	1	11	2	5507.70	7797.10
Kelsey	10	1	1	17	2	7054.40	7913.90
Madison	11	1	1	9	2	8154.40	11868.80
Mariah	11	1	1	7	2	10653.30	18202.40
Anna	13	1	1	12	2	12930.30	12449.90
Abby	14	1	1	11	2	19891.10	19041.00
Annie	15	1	1	15	2	8914.90	8787.63
Carin	15	1	1	11	2	6924.10	6080.10
Daeneese	16	2	1	18	2	9142.00	6436.70
Emily	17	2	1	18	2	7670.00	16269.60

Amy	17	2	1	17	2	7111.90	8273.10
Ashleigh	17	2	1	15	2	7920.00	7585.00
Tiffany	19	2	1	13	2	11370.10	13982.10
Kalani	20	2	1	14	2	13237.00	13788.30
Kawena	20	2	1	9	2	14781.60	19205.10
Bethany	23	2	1	16	2	10903.10	11615.10
Charity	23	2	1	14	2	10075.90	12943.70
Maya	27	2	1	12	2	10145.60	10997.70
Lora	35	3	1	7	2	10179.50	11426.20
Megan	37	2	1	13	2	9224.00	10866.80
Annie	43	3	1	17	2	9672.10	6289.60
Madison	43	3	1	14	2	9375.40	6682.90
Hannah	47	4	1	10	2	7081.40	6212.38
Jessica	71	4	1	16	2	9674.20	10388.80
Lilly	79	5	1	7	2	5157.10	5475.20
Beth	83	5	1		2	8906.70	10124.70
Brooke	83	5	1		2	7466.60	15509.38
Child 4	70	4	2		2	8077.50	8659.50
Child 2	70	4	2		1	12191.50	15167.70
Child 3	70	4	2		1	13978.70	15344.50
Mason	7	1	2	9	1	19163.00	15791.50
Rylan	9	1	2	6	1	14364.75	11094.50
Tyler	12	1	2		1	14339.40	17075.00
Ryan	12	1	2		1	20220.70	18002.00
David	18	2	2	16	1	10252.60	7903.30
Thomas	18	2	2	12	1	4277.80	8925.90
Mitchel	21	2	2	13	1	12757.60	11958.50
Joshua	22	2	2	11	1	14929.10	8258.10
Jake	53	4	2	11	1	8414.75	9059.80
Isaac	55	4	2	6	1	8548.50	8818.50
Braden	56	4	2	8	1	23330.70	19152.00
Matthew	58	4	2	17	1	18165.30	14715.60
Turner	58	4	2	15	1	16593.80	12811.20
Micah	58	4	2	9	1	20065.40	21656.70
Pierce	59	5	2	9	1	8241.00	12245.70
Archer	59	5	2	7	1	10244.40	10408.20
Brigham	63	5	2	7	1	13454.80	16044.90
Caleb	68	4	2	6	1	11640.40	13726.10
James	72	4	2	12	1	11929.20	6987.70
Peter	72	4	2	6	1	12764.00	6075.20
Mark	74	5	2	12	1	8634.00	9541.20
Joshua	75	5	2	11	1	17714.88	16679.88
Caleb	75	5	2	6	1	9130.83	10892.60
Cameron	78	5	2	7	1	5371.40	5164.50
Preston	82	4	2	9	1	7531.50	8028.20
Lexie	9	1	2	8	2	8966.63	8155.90
Chantel	12	1	2		2	12319.20	10671.50
Heather	12	1	2		2	18125.00	12505.20
Rachelle	21	2	2	10	2	12253.40	11634.70

Summer	22	2	2	15	2	6492.30	6648.80
Heather	26	2	2	7	2	16287.80	12827.30
Megan	26	2	2	6	2	16556.60	10951.10
Kate	39	2	2	10	2	6889.00	6004.40
Jacqueline	51	4	2	13	2	12913.70	15015.40
Cassandra	52	4	2	9	2	8546.90	9418.80
Megan	55	4	2	15	2	5783.90	5237.75
Rebecca	55	4	2	13	2	11605.00	7278.40
Allison	55	4	2	10	2	12246.70	14973.40
Hailey	56	4	2	6	2	10762.00	7784.90
Courtney	59	5	2	11	2	7500.20	8758.50
Rachel	63	5	2	12	2	8524.50	9778.20
Meggie	63	5	2	10	2	9763.00	16038.63
Katie	63	5	2	9	2	10389.38	13623.90
AnneMarie	68	4	2	9	2	5575.33	10715.50
Rachel	72	4	2	8	2	10559.60	2986.60
Cami	74	5	2	16	2	6114.60	6778.90
Holli	75	5	2	16	2	13322.75	7074.70