WALKING TO IMPROVE OUTCOMES IN PATIENTS WITH TYPE II DIABETES

A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Kelley Leigh Sanders

Liberty University

Lynchburg, VA

July 2022

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Scholarly Project Chair Approval:

Dr. Debbie Maddox RN, DNP, CNS-C, FNP-C. July 8, 2022

ABSTRACT

Walking is a simple, feasible, and effective exercise modality in which providers can instruct patients as a component of type II diabetic treatment plans. Many patients are overwhelmed when given instructions to exercise and therefore never begin. Lack of exercise contributes to poor glycemic control and adverse outcomes. Also, gym memberships can be expensive resulting in patients forgoing exercise altogether. The purpose of this DNP scholarly project was to conduct research outcomes which may enlighten providers to prescribe exercise interventions by providing evidence walking 45 minutes three times a week can improve glycemic control among type II diabetic patients. Also, the DNP scholarly project sought to answer the following clinical question: In type II diabetic patients, what is the effect of walking 45 minutes three times a week on HgbA1c levels compared with no exercise within three months? A group of four type II diabetics participated in walking 45 minutes three times a week for 12 weeks. The projected outcome was lowered HgbA1c among participants walking three times a week. HgbA1c was evaluated at the beginning of the project and at the end of the 12-week implementation period. The project aimed to examine the efficacy of walking as an effective and feasible exercise intervention for type II diabetic patients. The average HgbA1c among the group decreased from 8.4 to 7.475. Providers can prescribe walking prescriptions for type II diabetic patients to increase glucose control and lesson the stress for patients related to initiating exercise.

Keywords: type II diabetics, exercise, walking, glucose control, glycosylated hemoglobin (HgbA1c)

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SECTION ONE: INTRODUCTION

Type II diabetes is a chronic medical condition plaguing today's health care arena causing significant burden of overall health and wellbeing for many individuals. Sadly, type II diabetes is the most frequent metabolic condition seen throughout the world (Buttaro et al., 2021). Management for type II diabetes places large financial stress on healthcare systems, patients, and families (Arovah et al., 2018). Increased incidences of type II diabetes can be contributed to poor lifestyle choices and escalations in rates of obesity and sedentary lifestyles (Caron et al., 2018). Researchers estimate by 2035, about 592 million patients worldwide will be diagnosed with type II diabetes (Ruffino et al., 2017).

Many patients struggle with long term management of type II diabetes considering the complexity of the disease, motivation, social determinates of health, lifestyle, and socio-economic status. Lifestyle changes, specifically exercise, can significantly improve outcomes for type II diabetic patients and prevent adverse outcomes (Caron et al., 2018). Walking is a feasible exercise which can improve glucose control for type II diabetics. The purpose of the DNP scholarly project was to provide evidence to aid providers in prescribing walking prescriptions for type II diabetic patients to increase patient outcomes and prevent complications.

Background

The pathophysiology of type II diabetes includes insulin resistance, impaired insulin secretion, and increased hepatic production of glucose (Buttaro et al., 2021). Metabolic syndrome is strongly related to the development of type II diabetes and presents with abdominal obesity, increased triglycerides, low high-density lipoproteins, hyperglycemia, and insulin resistance (Buttaro et al., 2021). However, type II diabetes can be prevented through lifestyle changes such as diet and exercise (Yates et al., 2017). Symptoms of type II diabetes can progress

slowly, and some patients may be asymptomatic for long periods of time (Buttaro et al., 2021). Common symptoms include blurred vision, polyuria, polyphagia, polydipsia, and fatigue (Buttaro et al., 2021). Proper treatment of type II diabetes is essential to prevent devastating complications.

Type II diabetes is the most common cause of cardiovascular disease (Buttaro et al., 2021). Complications of uncontrolled type II diabetes includes retinopathy, nephropathy, neuropathies, macrovascular complications, and microvascular complications (Buttaro et al., 2021). Diabetic retinopathy may progress to total vision loss if untreated (Buttaro et al., 2021). Patients who experience poor glucose control are at greater risk for blindness associated with diabetic retinopathy (Buttaro et al., 2021). Sadly, evidence has revealed 80% of all type II diabetics will develop diabetic retinopathy (Buttaro et al., 2021). Furthermore, uncontrolled type II diabetes commonly results in diabetic neuropathy in 60 % of patients leading to end stage renal disease (Buttaro et al., 2021). Nerve damage, coronary artery disease, cerebrovascular accidents, and peripheral vascular disease are also common complications due to poor glucose control (Buttaro et al., 2021).

The mainstay of treatments for type II diabetics are lifestyle changes, medications, and close monitoring (Buttaro et al., 2021; Ruffino et al., 2017). Goals of treatment include maintaining glucose within proper ranges, improving quality of life, and preventing complications. Type II diabetes is a progressive disease which requires patient education and frequent follow ups to prevent adverse patient outcomes. Treatment with medications alone is not sufficient to successfully treat and manage type II diabetes.

Multiple studies have revealed that walking improves glucose control and overall health among type II diabetics by improving the bodies glucoregulatory activity (Arovah et al., 2018;

Chang et al., 2021; Karstoft et al., 2017; Moghetti et al., 2020; Regeer et al., 2020). Overall, exercise such as walking lowers patients glycated hemoglobin (HgbA1c), reduces low density lipoproteins, and lowers blood pressure which improves outcomes among type II diabetic patients (Chang et al., 2021; Moghetti et al., 2020; Ruffino et al, 2017; Yates et al., 2017). Walking lowers blood pressure by stimulating the release of vasodilators and increasing baroreflex sensitivity (Change et al., 2021; Yates et al., 2017). Walking reduces low density lipoproteins by implementing reverse transport of cholesterol (Chang et al., 2021). Walking facilitates improvements in cardiometabolic health which decreases total and cardiovascular mortality among type II diabetics (Arovah et al., 2018; Moghetti et al., 2020; Reynolds et al., 2020).

Problem Statement

Exercise is an essential component of type II diabetic treatment plans to improve outcomes and prevent complications (Caron et al., 2018; Moghetti et al., 2020; Ruffino et al., 2017). However, many patients become overwhelmed when given instructions to exercise and never begin. Lack of exercise contributes to poor glycemic control and adverse outcomes. Many patients cannot afford expensive gym memberships and forgo exercise altogether. Walking is a simple, feasible, and effective exercise modality which providers can instruct patients as a component of type II diabetic treatment plans.

Purpose of the Project

The purpose of this DNP scholarly project was to aid providers in prescribing exercise interventions by providing evidence that walking 45 minutes three times a week can improve glycemic control among type II diabetic patients. Walking is a significant intervention for type II diabetic patients to improve outcomes, improve quality of life and prevent complications (Regeer

et al., 2020; Reynolds et al. 2020; Ruffino et al., 2017. A group of type II diabetics participated in walking 45 minutes three times a week for 12 weeks. The projected outcome was lowered HgbA1c among participants walking three times a week. HgbA1c was evaluated at the beginning of the project and at the end of the 12 weeks. Participants were required to have a documented HgbA1c within six months of the project start date. The DNP scholarly project aimed to examine the efficacy of walking as an effective and feasible exercise intervention for type II diabetic patients.

Clinical Question

In type II diabetic patients, what is the effect of walking 45 minutes three times a week on HgbA1c levels compared with no exercise within three months?

SECTION TWO: LITERATURE REVIEW

Many type II diabetic patients do not fully understand what providers mean when given instructions to exercise (Caron et al., 2018). Evidence has revealed a vast number of patients struggle with implementing exercise interventions due to lack of knowledge, finances, and time constraints (Caron et al., 2018; Chang et al., 2020; Moghetti et al., 2020; Regeer et al., 2020; Reynolds et al., 2020; Ruffino et al, 2017; Yates et al., 2017). Exercise compliance is decreased among patients who are just given general instructions to exercise (Caron et al., 2018). However, walking is a safe, cost effective and efficient form of exercise for type II diabetics to improve glycemic control, increase overall health, and prevent complications (Caron et al., 2018; Chang et al., 2020; Moghetti et al., 2020; Regeer et al., 2020; Reynolds et al., 2020; Ruffino et al, 2017; Yates et al., 2017).

Walking interventions can be completed anywhere and expensive gym memberships are not required. Walking prescriptions can increase exercise compliance among type II diabetics

(Reynolds et al., 2020). Exercise, such as walking, must be added to treatment plans as research reveals walking accelerates adequate control of type II diabetes (Chang et al., 2020).

Search Strategy

A systematic search was conducted related to exercise and type II diabetes. Cochran Database of Systematic Reviews, PubMed, CINAHL, and Ebsco were searched. The following keywords were utilized in the search: exercise, walking, type II diabetes, and lifestyle interventions. Parameters included peered reviewed studies published in English within the last five years. Systematic reviews and randomized controlled trials were searched to present highest levels of evidence. To narrow down the results, the terms walking, and type II diabetes were implemented within the search. Fifteen articles were included in the literature review consisting of three systematic reviews, five randomized controlled trials, four non-randomized controlled trials, and three descriptive studies.

Critical Appraisal

Strengths of the literature review include high levels of evidence such as systematic reviews of randomized controlled trials, randomized controlled trials, and non-randomized controlled trials. Limitations of the studies selected include small sample sizes and not accounting for comorbidities. A systematic review was conducted related to walking and type II diabetes to provide clinical recommendations and found that walking improves glycemic control, blood pressure, weight, and cardiopulmonary fitness (Moghetti et al., 2020). A randomized controlled trial determined walking improves overall health and glycemic control (Arovah et al., 2018). Research revealed even if type II diabetics walk at a slower pace, walking is still effective for improving glycemic control based on a non-randomized trial (Caron et al., 2018). Multiple studies revealed walking at slow, brisk, or interval pace lowers glycemic control and improves

overall health among type II diabetics (Chang et al., 2021; Cigarroa et al., 2020; Karstoft et al., 2017; Ruffino et al., 2017). Also, education related to walking among type II diabetic patients increases exercise compliance (Yates et al., 2017). A table of evidence is provided (Appendix A).

Synthesis

In review of evidence, walking interventions for type II diabetic patients can improve glucose control, overall health, and prevent diabetic complications (Arovah et al., 2018; Chang et al., 2021; Karstoft et al., 2017; Moghetti et al., 2020; Reeger et al., 2020). Medications alone are not sufficient to manage type II diabetic patients. Lifestyle changes must be implemented to insure best management of type II diabetes. Many patients become overwhelmed with strenuous lifestyle changes which causes undo stress and anxiety. Furthermore, walking is a simple, low cost, and effective exercise intervention to improve exercise compliance among type II diabetics (Yates et al., 2017). Walking not only lowers blood glucose but provides an outlet to improve mental health and wellbeing (Reynolds, 2020). Providers must educate on the importance of walking interventions for type II diabetic patients to improve outcomes.

Conceptual Framework/Model

The Iowa Model of Evidenced-Based Practice was utilized as the conceptual model for the project related to walking interventions for type II diabetic patients. Triggers identified for the exercise project were lack of exercise compliance among type II diabetics due to lack of knowledge, finances, and feelings of being overwhelmed by the thought of exercise (Iowa Model Collaborative, 2017; Reynolds et al., 2020). Next, the clinical question was established per the Iowa Model such as, in type II diabetic patients, what is the effect of walking 45 minutes three times a week on HgbA1c levels compared with no exercise within three months (Iowa Model

Collaborative, 2017). Based on research, the topic is a priority so the team implemented the practice change and disseminated results (Iowa Model Collaborative, 2017).

A copy of the Iowa Model of Evidenced-Based Practice is included (Appendix B).

Summary

The literature review revealed type II diabetics are at increased risk of serious complications due to the disease process and poor glycemic control (Buttaro et al., 2021). Exercise is a vital component of type II diabetic treatment plans related to lifestyle changes (Caron et al., 2018; Chang et al., 2020; Moghetti et al., 2020; Regeer et al., 2020; Reynolds et al., 2020; Ruffino et al, 2017; Yates et al., 2017). Many type II diabetics struggle with exercise compliance (Reynolds et al, 2020). The simple exercise intervention of walking is effective in improving glucose control and preventing adverse outcomes (Chang et al., 2021; Cigarroa et al., 2020; Karstoft et al., 2017; Ruffino et al., 2017). Exercise instructions for walking can increase exercise compliance. The purpose of this DNP scholarly project is to conduct research outcomes that may enlighten providers to prescribe exercise interventions by providing evidence that walking 45 minutes three times a week can improve glycemic control among type II diabetic patients.

SECTION THREE: METHODOLOGY

Design

The evidenced based DNP scholarly project related to walking interventions to improve outcomes among type II diabetic patients was conducted by utilizing the Iowa Model for Evidenced Based Practice. Approval was granted to use the Iowa Model and is located in Appendix B. The pilot study of the project consists of a quasi-experimental design to evaluate walking and glycemic control among type II diabetic patients (Sullivan, 2018). A group of type II diabetic patients were recruited from a primary care office to volunteer to participate in the

quasi- experimental study. Each participant was instructed to walk 45 minutes three times a week and log walking activities. The team leader (DNP student), physician, and office staff educated participants regarding the study, walking requirements, and impacts on disease processes. The length of the study was 12 weeks and HgbA1c was tested initially and at the end of the 12 weeks. Participants were required to have a documented HgA1c within six months of beginning the project.

Measurable Outcomes

Glycated Hemoglobin (HgbA1c)

Setting

The DNP scholarly project was completed at a clinic in Roanoke, Texas which cares for a large population of uninsured patients with many deficits in social determinants of health. The clinic serves a significant population of uncontrolled type II diabetic patients who lack the resources and knowledge to optimally manage their disease. The clinic's mission is to provide low-cost healthcare to underserved populations which aligns with the purpose of this project. Dr. Griffin (owner and primary provider) gave permission to conduct the project within the clinic and offered to help as needed. Stakeholders included the community, patients, caretakers, Dr. Griffin, office staff and the DNP student leader. The vision of the project is to provide a low-cost exercise intervention to type II diabetic patient to improve glucose control and utilize data to inform future practice. A copy of site letter of support is included in the appendix C.

Population

This low-income type II diabetic population is desperately in need of low-cost lifestyle interventions to improve glucose control and overall health which was the rational for selecting this patient population and feasible intervention. Convivence sampling was utilized to obtain five

participants from the clinic to complete the study. Inclusion criteria included ages 18-80, male or female, diagnosed with type II diabetes, and ability to walk without assistive devices. Exclusion criteria includes no hospitalizations within the last six months. Average participants consisted of uninsured working-class patients ages 43-77 years old.

Ethical Considerations

Training in research ethics has been completed to ensure protection of human subjects when conducting research. The project was submitted to Liberty University's institutional review board (IRB) and complied with ethical research standards for the protection of participants. A copy of IRB approval is provided in appendix B. A copy of the DNP students Collaborative Institutional Training Initiative (CITI) Certificate is attached in appendix D. Informed consent was delivered for all participants including risks and benefits of participating in the walking study. Participant confidentiality was maintained throughout the project. The researchers maintained professional conduct and vowed to always protect the rights of all human subjects. Walking prescriptions were given to participants to improve glucose control and the researchers pledged to do no harm. Ethical treatment of participants was maintained throughout the entire project.

Data Collection

The DNP student along with the office staff collected HgbA1c levels at the beginning of the DNP scholarly project before implementation of walking interventions. If the patient had a documented HgbA1c within six months, no beginning lab work was required. Then HgbA1c was collected at 12 weeks which was the end of the intervention period. The team scheduled participants to come into the clinic for lab work and the DNP student collected all data and

organized to evaluate. The DNP student collected walking logs at 3, 6, 9 and 12 weeks of the study and analyzed to evaluate compliance with walking prescriptions.

Tools

Participants logged walking dates and times every week and presented to the DNP project leader to evaluate compliance at weeks 3, 6, 9, and 12. HgA1c levels were logged on an excel spread sheet by the DNP student to evaluate and analyze glycemic control related to walking.

Intervention

The team first began with the project development and plan. Next, IRB approval was secured. Then through convenience sampling the student gained five type II diabetic participants through the clinic. Clinic staff was educated on the project and trained regarding patient lab scheduling and patient education. The team educated participants and provided informed consent for the project. Participants were educated on the importance of lifestyle changes such as walking to improve glucose control and overall outcomes. Participants were instructed to walk 45 minutes three times a week for 12 weeks. Before implementation the team collected baseline HgbA1c levels from all participants or allowed previously obtained HgbA1c results within six months of the project start date. Participants logged times walked each week and presented logs on weeks 3, 6, 9, and 12. HgbA1c was collected again at the end of the 12 weeks. The implementation period was completed over 12 weeks and then the team evaluated and analyzed results. The process was completed over 12 weeks to increase compliance and provide enough time to improve glycemic control.

Timeline

The timeline for the scholarly project table depicts the milestones accomplished throughout the project including a description of all stages. (See Table 1.) Each milestone and

deliverable were accomplished by the dates listed. The DNP scholarly project proceeded in a systematic process and was completed according to the timeline.

Table 1

Timeline for scholarly project

Milestone	Deliverable	Description	Estimated Completion Date
Proposal	**Design and Proposal**	Project development/plan/proposal	January 30, 2022
Defense	**Proposal defense**	Scholarly proposal defense with chair	January 31, 2022
IRB	**Submission**	Submit to IRB for approval	February 1, 2022
IRB	**Granted IRB Approval**	IRB approval	February 15, 2022
Sample	**DNP student recruits' sample**	Collect Sample	March 25, 2022
Educate	**DNP student educates**	Educate clinic staff	March 28, 2022
Educate	**DNP student obtains informed consent**	Educate participants/informed Consent	March 29, 2022
Collect	**DNP student with office staff obtains initial lab work**	Initial HgA1c check	March 30, 2022
Start	**Intervention**	Implementation start date	April 3, 2022
Collect	**Exercise progress update**	Exercise log check at 3 weeks	April 23, 2022
Collect	**Exercise progress update**	Exercise log check at 6 weeks	May 14, 2022
Collect	**Exercise progress update**	Exercise log check at 9 weeks	June 4, 2022

Collect	**Project results**	12-week HgbA1c check and exercise log check	June 27, 2022
Analyze	**Completed project**	Evaluate and analyze results – meet with statistician	June 30, 2022
Final Defense	**Final Defense**	Defend scholarly project	July 8, 2022

Feasibility Analysis

The cost associated with the project includes HgbA1c level testing. Cost at a local lab without insurance is $40.00 per patient. Participants paid for HgbA1c testing initially and post intervention. The clinic allowed the DNP student to conduct the project free of charge. Overall, the project was considered cost effective as the walking intervention could be completed anywhere with no associated gym fees.

Data Analysis

A statistician was consulted related to measurable outcomes and statistical analysis. HgbA1c was evaluated to determine effectiveness of walking interventions for type II diabetic patients through the quasi-experimental study. Descriptive statistics and inferential statistics including paired t-testing was utilized to determine statistical significance of the walking intervention and glucose control (Sullivan, 2018).

Measurable Outcome 1

HgbA1c was tested before and after walking implementations to determine if walking 45 minutes three times a week improved glycemic control by lowering HgbA1c levels. Statistical significance was inferred if the p value was less than 0.05 and paired t-testing was utilized to determine if walking improved HgbA1c levels (Sullivan, 2018).

SECTION FOUR: RESULTS

The study began with five participants. Overall, four patients completed the study with one drop out. Aggregate demographics of the group consisted of the following: Caucasian, overweight males, type II diabetics, ages 43-77, working class, and mostly uninsured. The most successful participant was mostly compliant with walking only missing a few days due to sickness and his HgbA1c decreased from 10.5 to 6.6. The other four participants HgbA1c levels on average stayed the same as the initial result mostly likely due to missed walking sessions. However, the average HgbA1c of the sample decreased from 8.4 to 7.475. (See Table 2.) Three of the four participants lost weight after completing the study. (See Table 3.) Common causes of missed walking sessions included sickness, work obligations, and knee pain.

Table 2

Participant HgbA1c levels before and after walking implementation

Pt #	Initial HgbA1c	Post Walking Intervention HgbA1c	Difference
1	7.6	7.7	-0.1
3	10.5	6.6	3.9
4	5.4	5.5	-0.1
5	10.1	10.1	0
Mean	8.4	7.475	0.925
STD	2.376271589	1.967019742	1.983893478

Table 3

Participant weight tracking

Pt #	Initial weight (lbs.)	Post weight (lbs.)	Difference
1	206	204	2
3	258	252	6
4	188	184	4
5	299	305	-6
mean	237.75	236.25	1.5

Descriptive Statistics

Paired t-testing was used to determine statistical significance. Data were evaluated based on participants initial HgbA1c and then the post intervention HgbA1c. Even though the average HgbA1c decreased overall the results were not statistically significant. The p value was 0.419860968 which is not considered statistically significant. (See Table 4.)

Measurable Outcome

HgbA1c was the measurable outcome of the study. Overall, the mean of HgbA1c levels decreased from 8.4 to 7.475. The average difference was 0.925 from starting HgbA1c levels to post intervention HgbA1c levels.

Table 4

Paired t-testing statistics for initial and post walking intervention

	Initial HgbA1c	*Post Walking Intervention HgbA1c*
Mean	8.4	7.475
Variance	5.646666667	3.869166667
Observations	4	4
Pearson Correlation	0.596897017	
Hypothesized Mean Difference	0	
df	3	
t Stat	0.932509744	
P(T<=t) one-tail	0.209930484	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.419860968	
t Critical two-tail	3.182446305	

SECTION FIVE: DISCUSSION

Implication for Practice

This DNP scholarly project holds clinical and practical significance for type II diabetic patients. Walking is a practical intervention which is effective for improved glucose control and overall health. This project is important for medical providers to prescribe specific exercise interventions instead of simply instructing type II diabetic patients to exercise. Walking is a simple, low-cost intervention for type II diabetics to apply to lifestyle interventions to improve glucose control (Chang et al., 2021; Cigarroa et al., 2020; Karstoft et al., 2017; Ruffino et al., 2017). The project is important to the general public as walking increases overall health,

wellbeing and can contribute to weight loss (Arovah et al., 2018; Chang et al., 2021; Karstoft et al., 2017; Moghetti et al., 2020; Regeer et al., 2020). Providers must educate on the importance of walking for type II diabetic patients to improve health and prevent complications from poor glucose control (Chang et al., 2021; Moghetti et al., 2020; Ruffino et al, 2017; Yates et al., 2017). Detailed exercise instructions such as walking in addition to medications and diet is essential for improved outcomes and prevention of complications among type II diabetic patients (Caron et al., 2018; Chang et al., 2020; Moghetti et al., 2020; Regeer et al., 2020; Reynolds et al., 2020; Ruffino et al, 2017; Yates et al., 2017).

Sustainability

Prescribing walking prescriptions for type II diabetic patients is sustainable within practice to improve glucose control and overall health. A printed handout with walking instructions to walk 45 minutes three times a week would be beneficial for patients and providers. Low-cost interventions for type II diabetic patients are important to the community as most patients are among the uninsured working class. Limitations of the study included a small sample size and lack of compliance due to weather, motivation, time, employment constraints, and knee pain. Patient accountability, encouragement, and increased education were important lessons learned for increased compliance. The project could be more statistically significant with a larger sample size.

Dissemination Plan

Dissemination of these results were presented to the clinic staff and may potentially be used to develop new policies within the practice. These results can be the basis for another larger study related to walking and type II diabetic glucose control.

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Appendix

A. Strengths of Evidence Table

B. Permission for Iowa Model

C. Letter of Support

D. CITI Certificate

E. Patient Consent

F. Walking Log

G. Project Budget

H. IRB Approval Documentation

Appendix A

Evidence Table

Name: Kelley Leigh Sanders

Clinical Question: In type II diabetic patients, what is the effect of walking 45 minutes three times a week on HgbA1c levels compared with no exercise within three months?

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Arovah, N. I., Kushartanti, B. M. W., Washington, T. L., & Heesch, K. C. (2018). Walking with diabetes (WW-DIAB) programme a walking programme for Indonesian type 2 diabetes mellitus patients: A pilot randomized controlled trial. *SAGE Open Medicine, 6*,	To evaluate the effectiveness and feasibility of walking programs to improve overall health and glycemic control for type II diabetic patients.	A recruited sample of 43 type II diabetic patients from a public hospital in Yogyakarta, Indonesia.	A randomized controlled trial.	Findings indicate walking improves glucose levels and overall physical activity in type II diabetic patients. Walking programs for type II diabetic patients are feasible. Also,	Level 2: Randomized controlled trial.	All participants were recruited from the same hospital and the study included a small sample size.	Yes, this randomized controlled trial provides evidence walking can improve glucose control and physical activity for type II diabetic patients.

205031211881439. https://doi.org/10.1177/2050312118814391				text support increased walking compliance.			
Caron, N., Peyrot, N., Caderby, T., Verkindt, C., & Dalleau, G. (2018). Effect of type 2 diabetes on energy cost and preferred speed of walking. *European Journal of Applied Physiology, 118*(11), 2331-2338. https://doi.org/10.1007/s00421-018-3959-z	To compare metabolic rate, energy cost and speed of walking effectiveness between type II diabetic patients and healthy patients.	A volunteered sample of 20 type II diabetic patients and 20 healthy patients.	A non-randomized controlled trial.	Findings indicate type II diabetic patients walk with a higher metabolic rate at all speeds compared to healthy adult patients. Type II diabetic patients tend to select slower speeds of walking to compensate for higher energy requirements which allows them to gain an intense workout even at slower pace due to higher metabolic demands.	Level 3: Controlled trial with no randomization.	Not randomized and the diabetic sample did not have comorbidities such as peripheral vascular disease which is very common among the vast majority of type II diabetic patients.	Yes, this controlled study provided evidence for walking prescriptions for type II diabetics which can be considered moderate intensity exercise. The simple exercise of walking is an effective exercise for type II diabetic patients.
Chang, C., Kuo, C., Huang, C., Hwang, S., Liao, W., & Lee, M. (2021). Habitual physical activity and	Seeks to determine if moderate daily physical activity among type II diabetic	A study sample of 206 type II diabetic patients which were recruited from an	A descriptive correlational study using evaluation via	Findings indicate glucose control is improved with moderate	Level 6: Correlational descriptive study.	Sample was recruited using a convenience sample	Yes, this study provides evidence for the effectiveness

diabetes control in young and older adults with type II diabetes: A longitudinal correlational study. *International Journal of Environmental Research and Public Health, 18*(3), 1330. https://doi.org/10.3390/ijerph18031330	patients improves glycemic control?	endocrinology outpatient clinic. 95% of patients within the study experienced poor glycemic control. The mean hgbA1c was 7.8 %.	questionnaires.	daily exercise among type II diabetic patients. HgbA1c improved with daily exercise. More minutes of daily exercise improves glycemic control.		which can limit generalizability. Also, the study utilized used subjective data which increases the risk of recall bias.	of daily moderate exercise such as walking to improve glycemic control among type II diabetic patients.
Cigarroa, I., Espinoza-Sanhueza, M. J., Lasserre-Laso, N., Diaz-Martinez, X., Garrido-Mendez, A., Matus-Castillo, C., Martinez-Sanguinetti, M. A., Leiva, A. M., Petermann-Rocha, F., Parra-Soto, S., Concha-Cisternas, Y., Troncoso-Pantoja, C., Martorell, M., Ulloa, N., Waddell, H., & Celis-Morales, C. (2020). Association between walking pace and diabetes: Findings from the Chilean national	To assess walking pace related to type II diabetic glucose control among type II diabetics who walk for exercise.	5520 type II diabetic patients ages 15 to 90 years old were recruited from Chilean National Health Survey between 2016 and 2017. Participants rated walking pace as slow, average, or brisk.	A non-experiential descriptive survey.	Findings indicated participants who self-reported a brisk walking pace had lower Hgba1c levels and better glucose control. However, those with average and brisk walking paces had lower glucose levels when compared to all participants.	Level 6: Descriptive study.	Multimorbidity, body mass index, and socioeconomic status may have impacts on findings. Also, self-reporting could impact reliability.	Yes, even though level 6 evidence this study provides evidence that average to brisk walking can improve glucose control and health among type II diabetics.

health survey 2016–2017. *International Journal of Environmental Research and Public Health, 17*(15), 5341. https://doi.org/10.3390/ijerph17155341							
Edmealem, A., Ademe, S., & Tegegne, B. (2020). Level of physical activity and its associated factors among type II diabetes patients in Dessie referral hospital, northeast Ethiopia. *Diabetes, Metabolic Syndrome and Obesity, 13*, 4067-4075. https://doi.org/10.2147/DMSO.S279772	To evaluate factors related to physical activity (exercise) among type II diabetic patients.	364 type II diabetic patients were selected through systematic random sampling from a hospital in Ethiopia.	A cross-sectional observational study.	Depression, widowed, living in urban area, and length of disease were associated with lack of exercise among type II diabetic patients. More education is needed for type II diabetics to be successful with physical activity.	Level 6: Descriptive study.	Researchers noted potential for recall bias.	This study can be used to stress the importance of education regarding physical activity for type II diabetics and how to overcome barriers to exercise.
Hicks, D., Hickner, R. C., Govinden, U., & Sookan, T. (2021). Acute effects	To assess the acute effects of exercise in adults with type II diabetes.	PRISMA guidelines were utilized for inclusion of studies related to	Systematic review of randomized controlled trials.	Aerobic exercise improved glycemic control	Level 1: Systematic review of RCTs.	Small sample size was a limitation of the study.	This study can be used to aid in exercise recommendations for type II

of single-bout exercise in adults with type 2 diabetes: A systematic review of randomized controlled trials and controlled crossover trials. *JEMDSA: The Journal of Endocrinology, Metabolism and Diabetes of South Africa, 26*(1), 24-28. https://doi.org/10.1080/16089677.2020.1850033		exercise and type II diabetes. Three studies were included in the systematic review out of 205 total studies.		compared to resistance training. High intensity interval training is highly effective for type II diabetic patients who can tolerate. Aerobic exercise is effective in lowering glucose within the first 24 hours after exercise.			diabetic patients to improve outcomes.
Karstoft, K., Clark, M. A., Jakobsen, I., Müller, I. A., Pedersen, B. K., Solomon, T. P. J., & Reid-Larsen, M. (2017). The effects of 2 weeks of interval vs continuous walking training on glycemic control and whole-body oxidative stress in individuals with type 2 diabetes: A controlled, randomized, crossover	To determine the impacts of interval walking compared to continuous walking on glycemic control among type II diabetic patients.	14 type II diabetic participants with a BMI >18 were recruited to participate in this randomized controlled trial.	A randomized controlled trial.	Interval walking improved glycemic control over continuous walking among type II diabetic patients with a BMI >18.	Level 2: Randomized controlled trial	This study presented with a small sample size and interventions only lasted two weeks.	Yes, this study can be used to aid in exercise prescriptions for type II diabetic patients. Patients who can tolerate interval walking may have more improved glucose control.

trial. *Diabetologia, 60*(3), 508-517. https://doi.org/10.1007/s00125-016-4170-6							
Moghetti, P., Balducci, S., Guidetti, L., Mazzuca, P., Rossi, E., Schena, F., the Italian Society of Motor and Sports Sciences (SISMES), the Italian Society of Diabetology (SID), the Italian Association of Medical Diabetologists (AMD), Italian Society of Motor and Sports Sciences (SISMES), Italian Society of Diabetology (SID), & Italian Association of Medical Diabetologists (AMD). (2020). Walking for subjects with type 2 diabetes: A systematic review and joint AMD/SID/SISMES evidence-based practical guideline. *Nutrition, Metabolism,*	To conduct a systematic review related to walking interventions among type II diabetic patients to provide clinical recommendations	28 random controlled trials were included from 1872 screened randomized controlled trials. Inclusion criteria maintained all participants must be diagnosed type II diabetic patients, participation in a structured walking program, random controlled trials, and intervention length of at least eight weeks.	A systematic review of RCTs.	Walking among type II diabetic patients improves glucose control, body weight, blood pressure and over all cardiorespiratory fitness. Interval walking exercises are effective and can be prescribed especially in younger patients who are already physically fit.	Level 1: Systematic review of RCTs.	Many patients with type II diabetes have comorbid conditions which need special care before implementing walking prescriptions.	Yes, this study can be utilized in proving the necessity of walking prescriptions for type II diabetic patients. This study proved walking is the intervention of choice for type II diabetic patients to improve quality of life, glucose control, and decrease adverse effects.

and Cardiovascular Diseases, 30(11), 1882-1898. https://doi.org/10.1016/j.numecd.2020.08.021							
Regeer, H., Huisman, S. D., Empelen, P., Flim, J., & Bilo, H. J. G. (2020). Improving physical activity within diabetes care: Preliminary effects and feasibility of a national low-intensity group-based walking intervention among people with type 2 diabetes mellitus. *Lifestyle Medicine, 1*(2), n/a. https://doi.org/10.1002/lim2.10	To assess feasibility and effectiveness of low intensity walking intervention among patients with type II diabetes.	189 type II diabetic patients participated in a 20-week group walking intervention study and were recruited from 15 primary care practices.	A non-randomized controlled trial.	Low intensity walking improved type II diabetic patients HgA1c, emotional health and decreased somatic complaints. Walking interventions proved feasible to implement. Group walking is especially effective for improved outcomes and socialization. Participants also reported wanting to eat healthier after walking.	Level 3: Non-randomized controlled trial.	Non-randomized design is a limitation within the study.	Yes, this study proves walking to be a feasible intervention to improve glucose control among type II diabetic patients in addition to quality of life.

Pamungkas, R. A., Chamroonsawasdi, K., & Vatanasomboon, P. (2017). A systematic review: Family support integrated with diabetes self-management among uncontrolled type II diabetes mellitus patients. *Behavioral Sciences, 7*(3), 62. https://doi.org/10.3390/bs7030062	To review how family support impacts type II diabetic patients and self-managements such as diet, exercise, medications, and lifestyle interventions.	Through systematic search 22 studies were included in this review using Joanna Briggs Institute guidelines.	A systematic review.	Family support improves adherence to lifestyle changes like diet and exercise.	Level 1: Systematic review of RCTs.	The researchers report publication bias due to tendency to publish more positive than negative.	This study can be utilized to stress the importance of involving family and support persons when instructing on lifestyle changes to improve outcomes for type II diabetics.
Reynolds, A. N. (2020). How do we support walking prescriptions for type 2 diabetes management? facilitators and barriers following a 3-month prescription. *Journal of Primary Health Care, 12*(2), 173-180. https://doi.org/10.1071/HC20023	To determine barriers experienced by type II diabetic patients who were prescribed walking exercise prescriptions to improve glycemic control.	28 type II diabetic adults were recruited from general practices and outpatient clinics in Dunedin, New Zealand to complete a three-month walking trial to evaluate barriers.	Non-randomized controlled trial.	Walking prescriptions increased time of physical activity and self-rated overall health among type II diabetic patients. Barriers for walking included walking in the dark during evenings causing	Level 3: Non-randomized controlled trial.	Study was not randomized, involved a small sample size, and included self-reporting.	Yes, this study proves walking prescriptions for type II diabetic patients beneficial in increasing walking adherence and improving overall health and mental wellbeing.

				participants to be scared and participants expressing no desire to walk.			
Ruffino, J. S., Songsorn, P., Haggett, M., Edmonds, D., Robinson, A. M., Thompson, D., & Vollaard, N. B. J. (2017). A comparison of the health benefits of reduced-exertion high-intensity interval training (REHIT) and moderate-intensity walking in type 2 diabetes patients. *Applied Physiology, Nutrition, and Metabolism, 42*(2), 202-208. https://doi.org/10.1139/apnm-2016-0497	To compare the effectiveness of reduced exertion interval training and moderate intensity walking among type II diabetic patients.	21 type II diabetic patients were recruited from local UK advertisements and Southwest Primary Care Research Network. Among the recruited sample 16 patients completed the eight-week study.	A non-randomized controlled trial	Both high intensity interval training and moderate intensity walking interventions improved mean arterial pressure and plasma fructosamine. Reduced exertion interval training improved overall fitness over walking.	Level 3: Non-randomized controlled trial	The study was not randomized and included a small sample size. The safety of interval training among type II diabetic patients needs more research.	Yes, walking improves blood pressure and overall health of type II diabetic patients. Walking must be a long-term intervention for type II diabetics. It is not a short term treatment.
Solomon, T. P. J., Tarry, E., Hudson, C. O., Fitt, A. I., & Laye, M. J. (2020). Immediate post-breakfast	To assess timing of exercise in relation to improved glucose.	48 participants were selected randomly to participate in the randomized controlled trial.	A randomized controlled trial.	Exercising after breakfast was most effective in lowering blood glucose.	Level 1: Randomized Controlled Trial.	Some non-diabetic patients were included in the study.	This study can be utilized to encourage walking after breakfast to improve

physical activity improves interstitial postprandial glycemia: A comparison of different activity-meal timings. *Pflügers Archiv, 472*(2), 271-280. https://doi.org/10.1007/s00424-019-02300-4							glycemic control.
West, A. B., Konopka, A. R., LeBreton, K. A., Miller, B. F., Hamilton, K. L., & Leach, H. J. (2020). Incorporating behavior change strategies into an exercise trial to improve physical activity maintenance among adults at high risk for type II diabetes. *Journal of Aging and Physical Activity, 28*(6), 813-821. https://doi.org/10.1123/JAPA.2019-0307	To assess behavior change strategies among those high risk for type II diabetics completing an exercise program.	50 participants were recruited for the study after completing the original exercise trial and were randomized to the intervention or control group	A randomized controlled trial.	Education such as group discussions related to the benefits of exercise, barriers, and goal setting improved exercise adherence.	Level 1: Randomized Controlled Trial.	Researchers stressed future studies need more diverse participants.	This study can be utilized to encourage group education to improve type II diabetic exercise adherence.

Yates, T., Edwardson, C. L., Henson, J., Gray, L. J., Ashra, N. B., Troughton, J., Khunti, K., & Davies, M. J. (2017). Walking away from type 2 diabetes: A cluster randomized controlled trial. *Diabetic Medicine, 34*(5), 698-707. https://doi.org/10.1111/dme.13254	To determine if educational behavioral interventions for walking are effective in increasing walking activity among patients at risk for type II diabetes.	A sample of 808 patients at high risk for type II diabetes were recruited from ten primary care offices in Leicestershire, UK.	A randomized controlled trial	The intervention group (with group education) increased walking behaviors over the control group while participating within the study.	Level 2: Randomized controlled trial	Type II diabetes risk was not assessed through HgbA1c but through risk scoring which is less accurate.	Yes, this study can be utilized to provide evidence for education and support among patients to improve exercise adherence and overall results.

Appendix B

Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

From: Kimberly Jordan - University of Iowa Hospitals and Clinics [redacted]
To: Sanders, Kelley Leigh [redacted]
Date: Wed, Oct 27, 2021, 1:56 PM

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised (2015)

Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Reference: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

> In written material, please add the following statement:
> *Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.*

Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

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Appendix C

Letter of Support

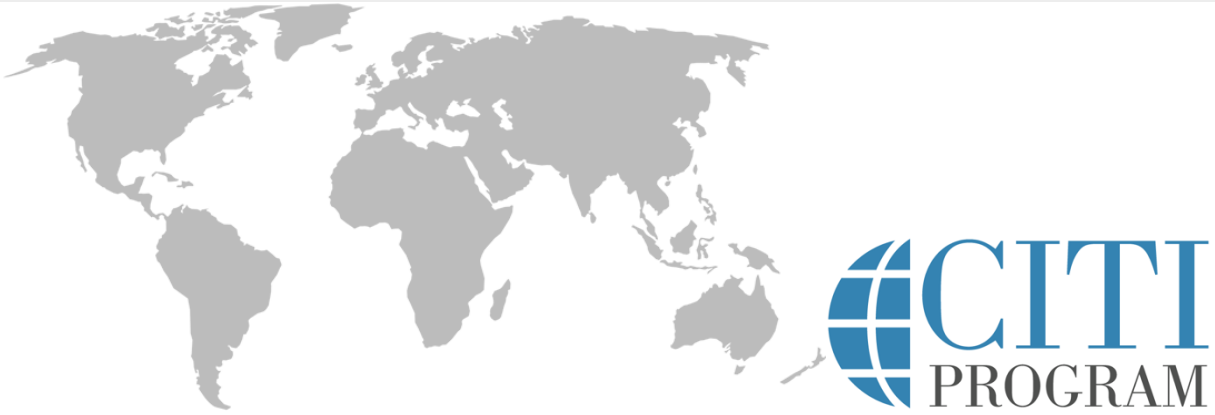
To whom it may concern:

I, hereby, grant Kelley L. Sanders permission to conduct a scholarly project related to type II diabetes and walking within Roanoke Family Medicine in Roanoke, Texas. Kelley may implement her DNP scholarly project under my supervision.

Dr. Brad Griffin, DO 12-9-2020

Appendix D

CITI Training Certificate



This is to certify that:

Kelley Sanders

Has completed the following CITI Program course:

Biomedical Research - Basic/Refresher

(Curriculum Group)

Biomedical & Health Science Researchers

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

Liberty University

Not valid for renewal of certification through CME.

Completion Date Expiration Date Record ID

16-Dec-2021 15-Dec-2024 46373137

Verify at www.citiprogram.org/verify/?w361d5da4-769f-41fe-8cc0-2f97b24bf484-46373137

Appendix E

Patient Consent

Title of the Project: WALKING TO IMPROVE OUTCOMES IN PATINET'S WITH TYPE II DIABETES
Principal Investigator: Kelley Sanders, RN BSN, Liberty University DNP student

Invitation to be Part of a Research Study

- You are invited to participate in a research study. To participate, you must be ages 18-70 years old, male, or female, diagnosed with type II diabetes, and ability to walk without assistive devices. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

- The purpose of this project is to conduct research outcomes that may enlighten providers to prescribe exercise interventions by providing evidence, that walking 45 minutes three times a week can improve glycemic control among type II diabetic patients.
- Walking is a significant intervention for type II diabetic patients to improve outcomes, improve quality of life and prevent complications.
- The project aims to prove walking is an effective and feasible exercise intervention for type II diabetic patients.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

- A group of type II diabetics will be selected by the DNP student to participate in walking 45 minutes three times a week for 12 weeks.
- The projected outcome is lowered HgbA1c among participants walking three times a week.
- HgbA1c will be evaluated at the beginning of the project and at the end of the 12 weeks.
- Participants will document exercise on a provided exercise log and the DNP student will check frequently in in with participants and provide education as needed.

How could you or others benefit from this study?

The direct benefits participants should expect to receive from taking part in this study are lowered HgbA1c by walking three times a week for 45 minutes and improved overall health.

What risks might you experience from being in this study?

The risks involved in this study include possible injury from walking and possible hypoglycemia during walking. The risks involved in this study are minimal, which means they are equal to the

risks you would encounter in everyday life. The researchers are mandatory reporters and must report abuse or self-harm.

How will personal information be protected?

The records of this study will be kept private. No names will be published with HgbA1c levels. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researchers will have access to the records. Data collected from you may be shared for use in future research studies or with other researchers. If data collected from you is shared, any information that could identify you, if applicable, will be removed before the data is shared.

- Participant responses and exercise logs will be anonymous. Participant responses will be kept confidential using codes. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted
- Interviews/focus groups will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researchers will have access to these recordings.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.

How will you be compensated for being part of the study?

Participants will not be compensated for participating in this study.

What are the costs to you to be part of the study?

To participate in the research, you will need to pay for two HgbA1c laboratory lab tests. However, if the patient has a documented HgbA1c result within six months the patient will only need to pay for one HgbA1c lab test at the end of the study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University or Roanoke Family Medicine. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Kelley Sanders, RN BSN, Liberty University DNP Student. You may ask any questions you have now. If you have questions later, **you are**

encouraged to contact her at [redacted]. You may also contact the researcher's faculty sponsor Dr. Debbie Maddox [redacted]

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researchers, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researchers will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

_____

Printed Subject Name

_____

Signature & Date

Appendix F

Walking log

Weeks of Walking – 45 minutes 3 times a week	Log walking dates and times
WEEK #1	
WEEK #2	
WEEK #3 (Exercise Check In)	
WEEK #4	
WEEK #5	
WEEK #6 (Exercise Check In)	
WEEK #7	

WEEK #8	
WEEK #9 (Exercise Check In)	
WEEK #10	
WEEK #11	
WEEK #12 (Exercise Check in & LAB CHECK)	

Appendix G

Project Budget

~4 Patients

~2 HgbA1c checks each

*40.00 x 2 = 80.00

*80.00 x 4 = $320.00

Appendix H

IRB Approval Documentation

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

February 15, 2022

Kelley Sanders
Debra Maddox

Re: IRB Application - IRB-FY21-22-692 WALKING TO IMPROVE OUTCOMES IN PATINET'S WITH TYPE II DIABETES

Dear Kelley Sanders and Debra Maddox,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your project with the data safeguarding methods mentioned in your IRB application.

Decision: No Human Subjects Research

Explanation: Your study is not considered human subjects research for the following reason:

Evidence-based practice projects are considered quality improvement activities, which are not "designed to develop or contribute to generalizable knowledge" according to 45 CFR 46.102(l).

Please note that this decision only applies to your current application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued non-human subjects research status. You may report these changes by completing a modification submission through your Cayuse IRB account.

Also, although you are welcome to use our recruitment and consent templates,

you are not required to do so. If you choose to use our documents, please replace the word *research* with the word *project* throughout both documents.

If you have any questions about this determination or need assistance in determining whether possible modifications to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office