

PRE-SERVICE TEACHERS; KNOWLEDGE, PEDAGOGY, AND PERCEPTION
REGARDING STUDENTS DIAGNOSED WITH TYPE 1 DIABETES

By

ALEXIS VICTORIA NULSEN

A Thesis Submitted to The Honors College

In Partial Fulfillment of the Bachelors degree
With Honors in

Education

THE UNIVERSITY OF ARIZONA

M A Y 2 0 1 8

Approved by:

Dr. Michelle Perfect
Department of Disability and Psychoeducational Studies

Acknowledgements

During the process of this honors thesis, I encountered and collaborated with a range of individuals who have helped me complete a common goal of educational research. I would like to thank the individuals who have helped me extensively in the data collection, written creation, and publication of this thesis. First and foremost, I would like to acknowledge my thesis advisor, Dr. Michelle Perfect. Her dedication to my spirit of inquiry made this process and project a great personal and professional achievement. Without her guidance and resource, I would not have been able to successfully complete the components needed for this project. Members of her team such as, Dr. Sara Frye, have simultaneously provided me support to experience data collection and entry at a novice professional level. This allowed my project to gain data evidence to support my theory. My college academic advisor, Shaun Cahill, has collaborated with members in multiple departments to ensure my success as an undergraduate honors student. His dedication to my success makes him an excellent advisor and vital piece of this project. These are the mentors and advisors who continuously supported this work but only a few of the many remarkable individuals I have encountered that have supported my goals in various ways over the course of this project. I am thankful to have completed this project within the Honors College of Education and hope this work provides inspiration for future educational research.

Pre-service Teachers; Knowledge, Pedagogy, and Perception Regarding Students Diagnosed with Type 1 Diabetes

Abstract

Type 1 Diabetes Mellitus (T1DM) is one of the most common pediatric chronic illnesses with approximately 1 in 400 youth diagnosed. There is little research done at the pre-service teacher level on training and knowledge retention of T1DM. This is a two-phase pilot study aimed at examining pre-service teacher knowledge on working with students with T1DM. A training program was developed to test the hypothesis that the designed training would be effective in supporting holistic classroom management and better prepare teacher candidates on their knowledge, perception, and pedagogy of students diagnosed with T1DM. Phase 1 of the study analyzed findings from literature review and completed studies on school success of students with T1DM. Findings showed a high absence rate, lack of parental knowledge regarding school support, and decreased academic performance according to glucose control. These findings were applied during Phase 2 to adapt training materials using an iterative process. Phase 2 tested participants' working knowledge of T1DM through a knowledge survey related to their perceptions, knowledge, and pedagogy before the training. Using a quasi-experimental, pre-post design, participants who attended the training re-answered the questions. The results from this study help predict change in training and protocol for pre-service teacher educators.

Currently, about 7.2% of Americans are diagnosed with Diabetes. Within this 7.2% statistic, 5% includes patients diagnosed specifically with T1DM (CDC, 2014). In 2009, there were approximately 167,000 youth diagnosed with T1DM (Imperatore et al, 2015). Between 2001 and 2009, there was a 21% increase of diagnosis for T1DM in youth below the age of 20 (Dabelea et al., 2014). By 2050, the number of affected youth suspected to be diagnosed with T1DM will rise to 600,000 (Imperatore, et al., 2012). These diagnosed youth struggle to balance daily physical symptoms such as fatigue, increased thirst, irritability, and frequent urination associated with T1DM while facing further complications such as kidney, nerve, and heart damage.

The US public school system is faced with the difficulty of providing adequate care for T1DM students. As students spend on average 40 hours per week in a school setting, the student's health and well-being rest greatly in the school personnel's liability and care. The

importance of ensuring a school staff is adequately trained to respond to a student who may be diagnosed with T1DM is of utmost value to protect the students in attendance. As many schools lack the presence of a full-time nurse, more responsibility for health care and health management is placed upon the educators. The public-school system has implemented a variety of training on T1DM for their educators, but results from existing literature show little change in delivery methods and knowledge retention for in-service personnel for accurate and adequate training on T1DM (DePaepe et al., 2002; Siminerio & Koerbel, 2000; Smith et al., 2012).

Within the last ten years, little research has surfaced on the professional development of pre-service teachers and the training they receive for students diagnosed with T1DM before entering a teaching career. The training methods offered to pre-service teachers need to be researched in order to support students diagnosed with T1DM with complete and holistic care during school hours. The proposed research analyzed the practice of training pre-service teachers and their efficacy towards students diagnosed with T1DM in order to create a more effective training module. The proposed research will theoretically answer pre- and post- knowledge, perceptions of pre-service teachers about students with T1DM, and whether a training (training program and practical) is well received. The results of the study predict a change for future training modules.

Literature Review

Health conditions such as T1DM are an inescapable factor within our school systems. Current forms of education on T1DM, mostly provided to in-service teachers, has been traditionally a direct instruction methodology and has regularly produced ineffective results regarding the recollection of imperative knowledge (Aycan et al., 2012; DePaepe et al., 2002; Siminerio & Koerbel, 2000; Smith et al., 2012). This review enhances the underlying need to

improve health management for all children but focuses more specifically on research for children who are diagnosed with T1DM. The review will highlight literature regarding academic and social effects on students diagnosed with T1DM, perceptions surrounding students diagnosed with T1DM in school, and previously tested programs delivered to in-service personnel about T1DM. The previous literature and research indicate the need for future training programs to be developed for pre-service teachers regarding students diagnosed with T1DM.

Effects on Student Success

Children who are exposed to health conditions, such as T1DM, are more likely to suffer negative impacts on their academic success and overall well-being while in school hours. The symptoms of these conditions are often associated with lower cognitive abilities, inability to stay focused, depressive moods which sometimes are related to disruptive classroom behavior. Certain impacts such as clinical depression, anxiety, and psychological distress can follow these children into their adult lives (Dantzer et al., 2003; Joe, Joe, & Rowley, 2009; Perfect, 2014; Reynolds & Helgeson, 2011). The risk to children that conclude from health disparity in academics mainly attributes to the social inequalities that are embedded within context to academic achievement (Joe, Joe, & Rowley, 2009). Future development of this research may include addressing the child as a whole being and taking into consideration the social factors that attribute to health consciousness and school success (Dantzer et al., 2003; Joe, Joe, & Rowley, 2009; Reynolds & Helgeson, 2011). The following eludes to consequences for students who are diagnosed with the invisible health condition of T1DM and how important the development of the whole-being is in effect to improve school health and resource management.

Youth diagnosed with T1DM compose a group of individuals as students that face difficulties in school success stemming from improper sleep patterns due to the diagnosis of their

chronic health condition (Perfect, 2014). With focus on the increased risk of vulnerability to discrimination and micro aggression in the classroom from the response to unbalanced sleep duration due to problems processing glucose and insulin, environmental factors, and the stress the chronic disease applies on a person led the researcher to study the effects of these factors in relation to school performance. Perfect determined that sleep habits and glucose control in students diagnosed with T1DM affect school performance by consistently revealing students averaged lower test scores and grade point averages. This discovery led to ideas surrounding practical accommodations to implement for school personnel (Perfect, 2014). This knowledge directly relates to potential studies to be conducted on teacher performance and the teacher's knowledge and ability to properly accommodate the student's needs. This creates a promising outlook on training beginning at a pre-service level to prepare teachers before encountering students diagnosed with T1DM. By understanding the physical effects the lack of sleep has on the child's brain while in school, assists in developing a more holistic view of this condition and how to better prepare teachers to monitor their student's performance in relation to their condition.

There has been documented note that psychological factors generate a very important role in students diagnosed with T1DM and their increased risk of anxiety and depression (Dantzer et al., 2003; Reynolds & Helgeson, 2011). Factors such as coping mechanisms and behavioral traits contribute to depression and anxiety in students diagnosed with T1DM; however, there is no significant evidence to support that anxiety and depression is directly influenced by metabolic control (regulating blood glucose levels). (Dantzer et al., 2003).

Students diagnosed with T1DM have a psychological role that the disease plays on their lifestyles. Recent research conducted links the psychological difficulties students diagnosed with

T1DM may face by comparing students diagnosed with T1DM to a group of non-diagnosed students. Various psychological symptoms a typical adolescent patient diagnosed with T1DM may face such as self-esteem, clinical depression, peer difficulties, anxiety, and psychological distress were slightly elevated; experiencing more depressive symptoms than the comparison group (Reynolds & Helgeson, 2011). Reynolds and Helgeson contributed to the need for further investigation of practices to lower the gap between the well-being of students diagnosed with T1DM and the well-being of undiagnosed students. Addressing the fact that students diagnosed with T1DM are an at-risk population strengthens the importance of developing training programs to ensure the wellness of these students in adolescence and their adult life.

Perceptions of Students, Parents, and Teachers

The following collaborates the perceptions from parents, children, and teachers to acquire how knowledge and information are presented and retained in regards to students diagnosed with T1DM. Researchers developed questionnaires that focused on applicable scenarios to children and teachers. The researchers compared the results to define the day to day situations, the main worries, and responses to help improve the integration of children diagnosed with T1DM during school hours. The main differences in survey answers were between student and teacher. Teachers underestimated the student's feelings of inclusion and frequency of negative peer relations. Teachers tended to minimize student's worries. Viewing the contrast between beliefs allowed the researchers to define miscommunication within the school system and help eliminate disconnect to provide more accurate information to teachers. According to Amillategui et al. (2009) and Schwartz et al. (2010) providing current information and updated methods to obtain knowledge on T1DM provides the school personnel with resources to further their understanding

and practice to deliver safe and meaningful instruction to not only students diagnosed with T1DM, but other disabilities or conditions.

Although most schools investigated reported overall positive experiences when encountering students diagnosed with T1DM, there is still a disconnect between school personnel perception and students' experiences (Schwartz et al., 2010). Schwartz et al. (2010) asserted that school personnel felt more confident in their knowledge and capability than the confidence that both students and parents had in the personnel. The study revealed that most of the diagnosed students felt they were treated differently by school personnel, that school personnel was not adequately trained, and that students felt embarrassed by their diabetes at times. The results of this study hold true in various districts and on a longevity scale as presented by the article.

Perceived management is a vital concern for students diagnosed with T1DM during school hours. Children from various age groups reported that school personnel, including teachers, nurses, and peers needed to improve their knowledge of T1DM (Nabors et al., 2003). Children expressed concerns regarding the teacher's flexibility within the classroom around the students' needs to test and re-test as well as taking a break if experiencing low blood sugar, even if it was in the middle of a lecture or test. Children commented that participating in after-school activities was inconvenient considering many times nurses were not available or the supplies students needed were locked in the nurse's office (Nabors et al., 2003). Mandali and Gordon (2009) agreed that even though federal regulations are in place, "School personnel are not always aware that diabetes is included under the American Disability Act. This gap in knowledge of policy and procedure leaves many school personnel who work with diabetic children with little or insufficient training." (p. 599). Using this direct insight allows future development for

teachers, nurses, and other school personnel to help students diagnosed with T1DM manage their diabetes at school. By understanding the management from the student's perspectives allows a targeted series of response to these issues.

Current Tested Programs in the U.S.

Transfer and accessibility of knowledge do not just occur. A school can provide educators with sourced materials and opportunities to strengthen their knowledge. Pre-service teachers are not exposed to a breadth of detailed knowledge about health conditions before entering the education field. Specific detail on a special education pre-service population revealed that most students felt inadequate to provide ample support and emergency treatment for a variety of disabilities and conditions, mostly related to health (DePaepe et al., 2002). A well-rounded pre-service program should offer knowledge of certain health conditions and how they affect student behavior.

Increasing techniques to develop the pre-service teacher knowledge of health management provides equal opportunity for students who may suffer from health conditions and limits the potential for mislabeling or degraded academic achievement related to their condition (DePaepe et al., 2002). Rapid advances in T1DM management and medical devices have risen. Often performed during school hours, the new testing technology available to students, frequency of testing, and the rise of student's responsibility of self-testing and regulation create an increase in the responsibility for teachers and paraprofessionals to further their working knowledge of T1DM (Siminerio & Koerbel, 2000; Smith et al., 2012). An accurate and current training would lessen the chance of discrimination or confusion when encountering students diagnosed with T1DM and their medical/device needs.

Establishing an effective mode of educational technique could improve the knowledge among school personnel to help students manage T1DM. Siminerio & Koerbel, (2000) requested diabetes educators from the Children's Hospital of Pittsburgh to incorporate diabetes education programs in six school districts. The results showed an increase in knowledge after the personnel attended the education program; the post-test was administered directly after the presentation. Results from the study show that school personnel better understand the effects and treatment of hypoglycemia and student's ability to attend school on a regular basis. The results also showed that this type of training did not improve knowledge in the areas of federal policy under the Americans with Disabilities Act, emergency [glucagon] treatment, or related symptoms to hyperglycemia. Although the study allowed school personnel to partially learn various attributes of T1DM management the conclusion showed that ongoing or prior training would be necessary to keep school personnel properly educated (Aycan et al., 2012; Siminerio & Koerbel, 2000; Smith et al., 2012). This contributed to the importance of building knowledge and training strategies that will boost performance and reliability of incoming teachers in the field when encountering students diagnosed with T1DM.

Internationally Tested Programs

The importance of improving training techniques to support students diagnosed with T1DM on a local, national, and international scale is justified by studies developed outside of the United States of America. Studies conducted by Aycan, Önder, Çetinkaya, Bilgili, Yıldırım, Baş, Kendirci, and Ağladıoğlu (2012) showed similar results to U.S. studies conducted on the knowledge and efficacy of practicing teachers when encountering students diagnosed with T1DM. The survey was given to 1500 teachers of different socioeconomic status and in primary and secondary grades in different regions of Ankara, Turkey. The researchers discovered that

teachers in Turkish schools also had limited resources and knowledge of T1DM and what to do when encountering a student diagnosed with T1DM (Aycaan et al., 2012).

To support that schools need programs to increase knowledge among school staff, a quote was pulled from the results of a diabetes education program, “Educational programs offered for school personnel can lead to increased knowledge and increased confidence in caring for students with diabetes, which may assist school personnel in addressing the needs of students with diabetes.” (Smith et al., 2012, p. 1). In the Smith et al. (2012) study one of the limitations featured included that school districts vary in funding and resources. Since the educational program in this study was held after school hours, it affected the amount of personnel that could attend the training program (Smith et al., 2012). Utilizing the resources of a university or community college level pre-service teacher program would potentially reach a larger number of participants and reduce the pressure on individual districts to provide a new training program for teachers. A population of pre-service teachers has a greater potential to carry their knowledge into more districts and schools. It would be more feasible to have available material or refresher courses for in-service teachers than trying to implement a full training program.

Supposition

The above literature shows multiple studies conducted on in-service teachers have provided evidence of limited transfer of knowledge and absorption of knowledge in the field regarding the care and management of students diagnosed with T1DM. A small amount of research has been done on pre-service teachers and the potential transfer and absorption of knowledge. There is a significant importance to provide students diagnosed with T1DM the best and most accurate care during school hours while dealing with this chronic health condition. Continuing research into the utilization of resources to provide training for pre-service teachers

prior to entering a teaching career will provide another outlook for these students and the potential benefit the students will receive from having prepared, well-versed, and flexible teachers. Through a quasi-experimental pre-post research process, the researcher hopes to gain substantial evidence yielding positive results towards the increased efficacy of pre-service teachers regarding students diagnosed with T1DM.

Present Study

The principal investigator (PI) of the proposed study received training and approval from the Institutional Review Board in order to correctly utilize research methods. The study was conducted in two phases. Phase 1 was used to ensure the training materials and survey questions accurately portray important facts and knowledge about students diagnosed with T1DM. Phase 2 was implemented on pre-service teachers to test a variety of their knowledge and future practice as an educator when encountering students diagnosed with T1DM. The study answered the questions of; “What is the working knowledge of the sample group?”, “Was the training well-received by the participants and did the training increase their knowledge on T1DM?”, and “What predicts change?”.

Methodology

Participants

Phase 1 of the study was composed of a detailed literature review and analyses from recently completed studies to ensure relevant and quality survey and training materials. Phase 2 was composed of a baseline survey, training, and post-assessment. The sample group for Phase 2 was recruited and chosen from junior and senior students currently in the University of Arizona Teacher Education Program. The participants were a sample chosen from the General Education cohort, the ESL/Multicultural cohort, or the Bilingual Education cohort. The participants are

from various socioeconomic status and range in age between 19-29. A group of ten students participated in the entire study. Students participated for the entire study had the incentive of a free working lunch at the researcher's expense during the training.

Baseline Survey

Phase 2 of the study design, after consent was received, distributed a baseline survey among participants to answer the proposed question of, "What is the working knowledge of the sample group?". The initial survey was the same for every participant, containing 48 questions, and took about 20-25 minutes for participants to complete.

The survey was developed by the researcher and organized by close-ended, multiple choice, or true/false based questions which are assigned labels for data analysis. The researcher pulled questions from various resources to help develop an accurate survey (Januszczyk, R, 2016, Amillategui, B et al. 2009, American Diabetes Association Training Resources, 2018). Close-ended questions include various demographic information (i.e. cohort group, age, gender, race/ethnicity, previous training). Questions about demographics were obtained for potential future studies of this material and if there are any other correlations between demographics and the results. Multiple choice and true/false questions are used in each of the four categories Personal beliefs/Perceptions, Knowledge about T1DM, Dietary Regimen, and Pedagogy (see Appendix (A) for questionnaire). The survey questions were designed to determine the baseline of knowledge participants in each of the four categories.

Training

Following the initial survey, a training was implemented on the participants that were willing to proceed. The training consisted of an interactive visual presentation and hands-on practical. The training lasted approximately 50-60 minutes. The visual presentation was designed

to inform the participants of the most necessary information they need to successfully manage students diagnosed with T1DM in their future classrooms. A PowerPoint was developed to highlight the most important aspects of T1DM in a classroom setting. The visual training included videos, group discussion, and practice test questions. The hands-on practical included a simulation in which the participants could test their blood glucose levels and simulate adjusting an insulin dosage. The simulation was a real-time experience in which the participants could physically check their blood glucose levels. The participants willing performed a finger prick and tested their blood glucose with a blood glucose meter. The participants were then asked to practice adjusting their blood glucose accordingly to what they were about to consume for a typical lunch. Those who were unwilling to do the hands-on practical were given a simulated number and asked to adjust accordingly to their given number. The training was designed to increase the knowledge of the participants on the four categories, respectively.

Post-assessment

To determine the question, “Was the training well-received by the participants and did the training increase their knowledge on T1DM?”, the same survey was distributed post-training, only to those who received the training. The survey, again, took 20-25 minutes for participants to complete. The post-assessment was administered directly after the training and participants were asked to finish before the facilitator left. If the training provided was successful there should be an increase in participant scores overall.

Comparative Analysis

The alternative question of, “What predicts change?”, was the scope to compare tested results of previous research to the proposed study. Comparing results of this training versus the

traditional direct instruction techniques from previously mentioned studies predicted what may result in change for future implications of its use.

Data Analysis

Using paired samples, the data were analyzed for variance in mean scores between the pretest and posttest scores for each of the participants. The variance in scores was used to determine if there was an increase of participants' knowledge between the pre-test and post-test. Frequencies were used to analyze demographic information and individual response rates. Scores were found based on a percent of correct answers out of 39. The tests were identical for both pre- and post. The following results outline major findings that support the research questions posed.

Results

Demographics

Out of 24 eligible participants, consent forms for 12 participants 50% were received and 10 participants 41.6% completed all the elements of the study. The population size of participants in this study is represented by (N=10), majority (90%) of the demographic was female. The age ranges of the participants fell mostly within 17-22 years of age. There was a combination of racial backgrounds present within the population size. All participants 100%; n = 10 recorded "no" that they had never received any form of training on T1DM. See Table 1.

Personal Beliefs/Perceptions

There were nine questions asked in the survey about personal beliefs and perceptions of the participants regarding T1DM. All participants 100%; n = 10 agreed that receiving more training would be useful and that there is a potential to encounter a student in their teaching career diagnosed with T1DM.

Pre-test data showed evidence of a lack of understanding about the permanence and diagnosis of T1DM in patients. Data showed that 40%; n = 4 of participants indicated that students could avoid T1DM with better physical activity and diet. Respectively, when questioned on the responsibility of care for students during field trips or outings 40%; n = 4 of participants reported that it is the parent's responsibility and not that of the teachers. Participants scored relatively high when asked if students diagnosed with T1DM can be negatively affected in their academic performance. Of the participants, 70%; n = 7 indicated that students diagnosed do tend to have negative impacts to their academic performance, whereas 30%; n = 3 of participants believed T1DM had no effect on students' academic performance. All participants knew that T1DM must be managed seven days a week and twenty-four hours a day, but lacked understanding in other areas of perception about the disease.

Post-test data showed a higher result in understanding regarding diagnosis, responsibility, and effect on performance. All participants recorded in the post-test that "no" T1DM cannot be avoided by physical activity or diet, "no" to if it is the parent's responsibility to care for students on field trips or outings, and "yes" that T1DM indeed can negatively affect students' academic performance who are diagnosed. Participants' average scores were the second highest in personal beliefs/perceptions, compared to other sections tested, with scores composed of (86%) average for pre-test scores and (96%) average for post-test scores.

Knowledge About T1DM

Participants were asked sixteen basic questions about their knowledge of T1DM and the elements of the disease. Questions were straight-forward and many were verified from previous studies and the American Diabetes Association.

There were certain instances in the data where there was not an increase in individual question score. When participants were asked what functions in the body T1DM effects the results between pre- and post- tests slightly went down. During the pre-test, 80%; n = 8 of participants indicated the correct answer that the body produces too much glucose and does not use insulin properly. Post-test scores showed a minor decrease with only 70%; n = 7 of participants answering correctly. The cause of this decrease is unknown but signified the need for heightened clarification during the training process. The knowledge portion of the survey, 16 questions, yielded the lowest score ranks within the test for both pre- and post- scores. The average test score for the knowledge area of the survey showed a 56% average for the pre-test and a 68% average for the post-test score. This indicated an increased selection process for survey questions or the training material may need to be adapted to clarify the biologic processes of T1DM.

Dietary Regimen

The data for dietary regimen varied in certain areas for the pre-test portion of the survey with a few definite shifts present in the data. The researcher noticed the most drastic shift between the variable for insulin dosage and component for insulin adjustment. When looking at Table 2, it reports that 90%; n =9 of participants reported sugar content as the main component for insulin dosage and the exact percentage indicated adjustment is reliant on carbohydrate consumption. This told the researcher that participants were unsure of which content a student with T1DM counts to dose and administer insulin.

The post-test scores of the participants showed a clear increase in knowledge on the same two content questions after attending the training (Table 2). The 'Dietary Regimen' portion of the training was focused on the adjustment and dosage experience students with T1DM face.

Although 100%; n= 10 of participants did not answer correctly for insulin dosage, there was a definite change in answer selection. This level of increase suggested the training was effective in delivering information about insulin dosage and adjustment.

When participants were asked pedagogical practice based dietary questions such as if, “Students should have access to drinking water at all times.” and “A student diagnosed with T1DM should be allowed to eat in the classroom.” 100%; n = 10 of participants reported in both the pre- and post- test that “yes” students diagnosed should be allowed these contingencies. This data is congruent with the higher averages in score within the categories of perception and pedagogy practice. The survey showed misconceptions on whether nutritional needs of students diagnosed with T1DM differ from other students. In the pre-test, 100%; n = 10 of participants indicated nutritional needs do differ from that of a regular student. Post-test scores revealed that 70%; n =10 of participants still believed the nutritional needs of students diagnosed with T1DM differ. While participants scored high in certain areas of this section, the overall scores were low. For the nine questions in this section, pre-test score average fell at 58% overall for participants and post-test scores improved but averaged at 81%.

Pedagogy

The pedagogy portion of the survey was composed of six questions related to how the pre-service teacher may use their practice within their classroom when a student with T1DM is present. Participants scored the highest average in this area for both the pre- and post-survey. In pedagogy, pre-test scores averaged at 85% and post-test scores averaged at 96%. Indications on both pre- and post- survey showed 100%; n =10 percent to answer, “yes” a student diagnosed should be able to go on field trips or outings, and “yes” if the student were unable to take an exam they would be permitted to retest. The area of most improvement between pre- and post-

survey is shown within the question on who should be permitted to test blood glucose, administer insulin, and deliver snacks. The survey asked participants if only the nurse should be allowed to complete these tasks for students diagnosed with T1DM. In the pre-test, 50%; $n = 5$ of participants indicated that “yes” only the nurse should be allowed to complete these tasks. After receiving the training, 100%; $n = 10$ of participants indicated that “no” the nurse is not the only person to be allowed to complete these tasks. See Table 3. There were no other areas in the pedagogy section that participants scored less than 80%; $n = 8$ for pre- or post-test questions.

Overall Score

To test the question of if post-training scores ($M=31.7$; $SD 2.67$) were increased by attending the designed training, a dependent variable t-test was performed. Using paired samples, the data were analyzed for the variance in pre-test scores as baseline knowledge and post- test scores after a training was implemented. In looking at Table 4, Paired Samples Statistics chart, the mean for pre-test scores was ($M=26.1$; $SD 3.28$). The mean for post-test scores is ($M=31.7$; $SD 2.67$). These averages are also depicted as a bar graph to show the increase in Figure 1. The standard deviation lowers in post-test scores indicating that more participants scored closer to the average. The number of participants in each condition (N) is 10. The Sig. (2-tailed) value in our example is $p = 0.005$. The value reported, $p = .004$, is less than that of our Sig. (2-tailed) value thus concluding that there are statistical differences in the data reports for participants who attended the training. When scores were analyzed, pre-service teachers’ pre-test scores were significantly lower ($M=26.1$; $SD 3.28$) than when provided the training and the post-test ($M=31.7$; $SD 2.67$), $t(9) = -3.850$, $p = .004$. These results statistically suggest that participants who attended the training increased their test scores.

Discussion

Summary of the study

To the researcher's knowledge, this is one of the first studies or pilot studies to investigate the knowledge, perception, and pedagogy practice of pre-service level teachers. The study was conducted to explore the influence of a developed training module on the knowledge and practice of aspiring teachers regarding students diagnosed with T1DM. The results of this study supplied new information and data about the working knowledge of pre-service teachers.

Findings

The main finding of this study is that participants overall increased their knowledge by attending the designed training. The findings above noted that pre-service teachers are not always exposed to prior training on T1DM and participants agreed that further or initial training would be helpful to their career. This pilot study showed prevalence for continuing research and exposing the pre-service teacher population to vital information about students diagnosed with T1DM.

Pre-service teachers tended to score higher in the areas of perception and pedagogy practice, but scored low in areas of knowledge or dietary needs/functions. The participants responded well to the training when the researcher evaluated their scores. The results highlighted the most prevalent differences in pre- and post- test questions. The scores of the pre-survey allowed the researcher to begin to answer the tested research question of what knowledge pre-service teachers already have in a teacher education program on T1DM. Implementing the training and administering the post-survey supplied information to begin answering if a training increased the knowledge and retention rate of pre-service teachers.

The data collected from this study seemingly aligns with previously tested studies on in-service teachers regarding encountering students diagnosed with T1DM (Siminerio & Koerbel,

2000; Smith et al., 2012). This pilot study did not run a statistical comparative analysis but when analyzing initial reports and comparison of previously reported results, it may be concluded that a training program delivered to pre-service teachers may be successful in higher knowledge retention and preparation. There was a main indication of result that posed similarity between this study and previously completed studies.

- 1.) On-going or continuous training would be necessary to adequately raise the knowledge of pre- or in-service teachers regarding students diagnosed with T1DM in all categories tested.

The concept of a holistic training program to be delivered before aspiring teachers enter their careers could potentially raise the results of similar trainings for in-service teachers. If pre-service teachers are exposed to the training and knowledge regarding students diagnosed with T1DM, their knowledge retention may be greater than that of a teacher who may have had zero or very little exposure. Further research would need to be composed to accurately and statistically test this hypothesis. The data collected from this pilot study is a beginning framework for future studies and training possibilities.

The implementation of this study not only revealed information about baseline knowledge of pre-service teachers, it helped the research clarify potentially vague or invalid test questions. The data showed discrepancies in certain questions and lead the researcher to believe there could be improvement in either the writing of the survey question or adaption of the training material.

Limitations and Future Directions

The study design may have general limitations that could impact the overall outcome. The sample size of this study is relatively small, which means the results may not accurately

depict an overall sense of knowledgeability among pre-service teachers. The size of this study was not large enough to accurately portray a complete comparative analysis for all previously completed studies in relation to the study being conducted. The study was only conducted on the University of Arizona Teacher Education Program, thus limiting its data to only one school's program. It is also assumed by the researcher, that many participants will be willing to take part in the training module. An additional limitation of this study is the amount of time that is allotted within class time to conduct the training module. To ensure maximum possible attendance the training was conducted during a professor's class hours. Students were still able to decline participation but were encouraged to attend the training. Without this time slot, the number of participants would have drastically declined. Limitations are expected for this study design.

The module is an adapted version stemming from longer, more in-depth training supplied by the American Diabetes Association. A trained professional is required to conduct the simulation portion of the training. Depending on training site location and availability of a trained professional it may not be feasible to conduct this study long term or at multiple sites. A control group was not used in this study design but there is potential for a control group to be implemented in future studies. A control group would almost certainly need to be used in order to accurately test the significance of raised test scores. A threat to internal validity may arise when considering the use of differential selection. The group of students was already arranged and the research was not able to randomly select participants. These limitations are natural to most quasi-experimental studies and were considered when conducting and reporting on the study.

For future design of the study a larger population would be recommended to achieve a greater gauge on the effectiveness of the study design. The study would be most beneficial as a

professional development offered to pre-service teachers. The ideal setting would be furnished by a professor to achieve the highest attendance and participation rate. For quality educational measures, the training may be broken into parts and offered in multiple sessions. The material could be more in-depth to ensure thorough understanding. A future goal of this study would be to prove enough validity to make a training mandatory for pre-service teachers to attend before achieving their certification. An increased interactive process would be ideal to furnish a more relevant survey and increase likelihood of well-written survey questions. A future researcher could consider interviewing patients of T1DM, their families, and healthcare providers to determine the best fit questions to ask on a survey questionnaire. The study may be adapted in part or whole to include other health conditions that are likely to be present in the classroom setting.

The data showed critical information on the formation of questions and categorization of questions. To create a more succinct study, the survey would be best split into lesser parts. As the data indicated, pre-service teachers are likely to score higher in the areas of perception/pedagogy and lower in knowledge/dietary need. If the survey were to be split into lesser parts, the future research would better gauge the capacity of knowledge the pre-service teachers hold.

A test for reliability and validity should be conducted on the study survey. To check for reliability, a test-retest may be performed on the participants to inform the researcher if the survey produces reliable data consistently. Using this format will enhance the development of the survey to include crucial information and user friendliness. When examining the validity of this survey, the external validity could be improved. With such a small sample size, the data provided may not be accurate on a generalizable scale. The data helped show the researcher areas of

improvement for future study design. As research is often an iterative process, future research for this study would be to examine the processes closely and improve the items and methodology.

Conclusion

This pilot study was created and implemented to analyze the capability of its elements on a larger scale. With respect to a few natural limitations, the study otherwise would be feasible to implement on a larger scale. There is emergent data that suggests this study would positively impact the knowledge pre-service teachers acquire on T1DM before beginning their aspiring careers. Developing similar studies and trainings to pre-service teachers would enhance the common teacher community's knowledge and preparation for this increasing disease. The study launched with an aim to create a more prepared community of educators to harbor safer and more holistic environments for children to learn. The study shows pre-service teachers may tend to have a lower level of basic understanding of T1DM and highlights the need for educational progress in pre-service teacher training. There is consistent room for educational methods and techniques to progress and improve. In the event this study was to launch on a larger scale, the data could change the ways we deliver information to aspiring teachers before entering the classroom.

Appendix A

Confidential

Page 1 of 7

Knowledge Survey

Please complete the survey below. Please select your best guess for each question.

T1DM - Type 1 Diabetes Mellitus

Thank you!

University of Arizona Email Address _____

- 1 Your age 17-22
 23-28
 29-34
 35-40
 40+
-
- 2 Gender Male
 Female
 Transgender
 Prefer not to answer
-
- 3 Cohort program General
 ESL
 Bilingual
-
- 4 Race/Ethnicity Caucasian
 African American
 Latino
 Hispanic
 Asian
 Pacific Islander
 Mixed races

Please specify _____

- 5 How many weeks have you spent in field placement since starting in the cohort program (not including former pre-college experience)? 1-5 weeks
 6-11 weeks
 12-17 weeks
 18-23 weeks
 24-29 weeks
 30-35 weeks
-
- 6 Are you, or anyone you currently know, diagnosed with Type 1 Diabetes Mellitus (T1DM)? Yes
 No
-
- 7 Have you ever received training or information on T1DM? Yes
 No

Confidential

Page 2 of 7

8 Where did you receive the training/information?

- Friends Family Healthcare
professional Internet
 School Other

Please Specify

Confidential

Page 3 of 7

Personal Beliefs/Perceptions

- 9 Would it be more useful to receive more information on supporting children with diagnosed with T1DM in school settings? Yes No
-
- 10 T1DM should be managed at? Home School Both
 Neither
-
- 11 A child diagnosed with T1DM is worried about being different from his/her peers? Yes No
-
- 12 It is possible you will encounter a student diagnosed with T1DM within your teaching career? Yes No
-
- 13 Students could avoid T1DM with better physical activity and diet. Yes No
-
- 14 All children are able to manage their diabetes without the help of an adult. True False
-
- 15 A student diagnosed with T1DM can have negatively affected academic performance due to their condition. True False
-
- 16 It is the parent's responsibility to care for students diagnosed with T1DM on school outings and field trips. Yes No
-
- 17 T1DM must be managed 24 hours a day, 7 days a week. True False

Confidential

Page 4 of 7

Knowledge	
18	What is T1DM? <input type="radio"/> A. Body produces too much glucose <input type="radio"/> B. Body does not make or use insulin properly <input type="radio"/> C. Joints are stiff and painful <input type="radio"/> D. A and B
19	Insulin makes blood glucose go? <input type="radio"/> Up <input type="radio"/> Down <input type="radio"/> Stay the same
20	Insulin is administered through: <input type="radio"/> A. Mouth <input type="radio"/> B. Syringe <input type="radio"/> C. Pump or Pod <input type="radio"/> D. Meter <input type="radio"/> E. Pen <input type="radio"/> F. B, C, and E <input type="radio"/> G. None of the above
21	In undiagnosed T1DM, the blood glucose level is? <input type="radio"/> High <input type="radio"/> Low <input type="radio"/> Normal
22	When a student with T1DM says, "I am having a hypo" is their blood glucose... <input type="radio"/> High <input type="radio"/> Low <input type="radio"/> Normal
23	Which of the following is the best treatment for hypoglycemia? <input type="radio"/> Water <input type="radio"/> M&Ms <input type="radio"/> 4oz Orange juice <input type="radio"/> Carrot sticks
24	If a student diagnosed with T1DM starts to experience thirst, vomiting, and stomach pain, their blood glucose level is likely to be? <input type="radio"/> High <input type="radio"/> Low <input type="radio"/> Normal
25	If a student diagnosed with T1DM starts to experience dizziness, sweating, and confusion their blood glucose level is likely to be? <input type="radio"/> High <input type="radio"/> Low <input type="radio"/> Normal
26	If left untreated, T1DM can cause brain damage and death. <input type="radio"/> True <input type="radio"/> False
27	What causes Hypoglycemia? <input type="radio"/> Too much insulin <input type="radio"/> Too little food or delayed meal <input type="radio"/> Unanticipated physical activity <input type="radio"/> All of the above
28	Should a child experiencing a "hypo" be left unattended? <input type="radio"/> Yes <input type="radio"/> No
29	Students who are able to self-manage should be able to check their blood glucose in the classroom. <input type="radio"/> True <input type="radio"/> False
30	Schools are required to provide diabetes care supplies for students. <input type="radio"/> True <input type="radio"/> False
31	A student diagnosed with T1DM is required to have a 504 Plan in place. <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Sometimes
32	All students diagnosed with T1DM fall under the IDEA Act and its mandates. <input type="radio"/> Yes <input type="radio"/> No
33	What is the name of the written plan signed by the student's healthcare provider that sets out diabetes care in the school setting? <input type="radio"/> Section 504 <input type="radio"/> Individualized Health Care Plan <input type="radio"/> Diabetes Medical Management Plan

Confidential

Page 5 of 7

Dietary Regimen

- 34 Students diagnosed with T1DM require a special meal during lunchtime. Yes
 No
 Sometimes
-
- 35 It is reasonable for students diagnosed with T1DM to miss or be late for a meal. Yes
 No
 Sometimes
-
- 36 Which variable is important for determining insulin dose and can be provided by the school food service manager? Fat content
 Wheat content
 Sugar content
 Carbohydrate content
-
- 37 It is necessary for students diagnosed with T1DM to have access to snacks throughout the day. Yes
 No
-
- 38 Students diagnosed with T1DM should wait at least fifteen minutes after adjusting their insulin to eat. True
 False
 Sometimes
-
- 39 Adjusting insulin is reliant on the amount of carbohydrates the patient is consuming. Yes
 No
-
- 40 Students diagnosed with T1DM need to have access to drinking water at all times. Yes
 No
-
- 41 A student diagnosed with T1DM should be allowed to eat in the classroom during lessons. Yes
 No
-
- 42 Nutritional needs of students diagnosed with T1DM differ from an undiagnosed student. True
 False

Confidential

Page 6 of 7

Pedagogy

- 43 Students diagnosed with T1DM should be allowed to go on school outings and field trips.
 - Yes
 - No
 - Sometimes

- 44 If a child diagnosed with T1DM is unable to do an exam, would there be other opportunities for the student to retest?
 - Yes
 - No

- 45 Only the nurse should test glucose levels, administer insulin, or deliver snacks to the student diagnosed with T1DM.
 - Yes
 - No

- 46 Students diagnosed with T1DM shall be permitted to have unrestricted restroom access.
 - Yes
 - No

- 47 Students diagnosed with T1DM should not be allowed "treats" or "candies" during school parties or reward systems.
 - Yes
 - No

- 48 Blood glucose monitoring supplies such as lancets and syringes are permitted to be in the classroom.
 - Yes
 - No

Confidential

Page 7 of 7

Further Training Contact

- 49 Mark 'yes' if you would like to be contacted for Phase 2 of Training.
 - Yes
 - No

References

- American Diabetes Association. Training Resources. (2018, April 24). Retrieved April 30, 2018, from <http://www.diabetes.org/living-with-diabetes/parents-and-kids/diabetes-care-at-school/school-staff-trainings/training-resources.html>
- Amillategui, B., Mora, E., Calle, J. R., & Giralt, P. (2009). Special needs of children with type 1 diabetes at primary school: perceptions from parents, children, and teachers. *Pediatric diabetes, 10*(1), 67-73. doi: 10.1111/j.1399-5448.2008.00457.x
- Aycan, Z., Önder, A., Çetinkaya, S., Bilgili, H., Yıldırım, N., Baş, V. N., ... & Ağladioğlu, S. Y. (2012). Assessment of the knowledge of diabetes mellitus among school teachers within the scope of managing diabetes at school program. *J Clinical Research Pediatric Endocrinology, 4*, 199-203. doi: 10.4274/Jcrpe.756
- Centers for Disease Control and Prevention. (2014). National diabetes statistics report: estimates of diabetes and its burden in the United States, 2014. *Atlanta, GA: US Department of Health and Human Services, 2014*
- Dantzer, C., Swendsen, J., Maurice-Tison, S., & Salamon, R. (2003). Anxiety and depression in juvenile diabetes: a critical review. *Clinical psychology review, 23*(6), 787-800. doi: 10.1016/S0272-7358(03)00069-2

- DePaepe, P., Garrison-Kane, L., & Doelling, J. (2002). Supporting students with health needs in schools: An overview of selected health conditions. *Focus on exceptional children, 35*(1), 1.
- Imperatore, G., Boyle, J. P., Thompson, T. J., Case, D., Dabelea, D., Hamman, R. F., ... & Rodriguez, B. L. (2012). Projections of type 1 and type 2 diabetes burden in the US population aged < 20 years through 2050. *Diabetes care, 35*(12), 2515-2520
- Imperatore, G., Mayer-Davis, E. J., Orchard, T. J., & Zhong, V. W. (2010). Prevalence and incidence of type 1 diabetes among children and adults in the united states and comparison with non-us countries. *Childhood, 2006*, 0-19.
- Januszczyk, R. L. (2016). Knowledge and awareness of type 1 diabetes among primary school initial teacher trainees. *Journal of Diabetes Nursing, Volume 20*.
- Joe, S., Joe, E., & Rowley, L. L. (2009). Consequences of physical health and mental illness risks for academic achievement in grades K–12. *Review of Research in Education, 33*(1), 283-309. doi: 10.3102/0091732X08327355
- Mandali, S. L., & Gordon, T. A. (2009). Management of type 1 diabetes in schools: whose responsibility?. *Journal of School Health, 79*(12), 599-601. doi: 10.1111/j.1746-1561.2009.00456.x

- Nabors, L., Lehmkuhl, H., Christos, N., & Andreone, T. L. (2003). Children with Diabetes: Perceptions of Supports for Self-Management at School. *Journal of school health, 73*(6), 216-221. doi: 10.1111/j.1746-1561.2003.tb06563.x
- Perfect, M. M. (2014). The relations of sleep and quality of life to school performance in youth with type 1 diabetes. *Journal of Applied School Psychology, 30*(1), 7-28. doi: 10.1080/15377903.2013.853718
- Reynolds, K. A., & Helgeson, V. S. (2011). Children with diabetes compared to peers: Depressed? Distressed?. *Annals of Behavioral Medicine, 42*(1), 29-41. doi: 10.1007/s12160-011-9262-4
- Schwartz, F. L., Denham, S., Heh, V., Wapner, A., & Shubrook, J. (2010). Experiences of children and adolescents with type 1 diabetes in school: Survey of children, parents, and schools. *Diabetes Spectrum, 23*(1), 47–55. doi:10.2337/diaspect.23.1.47
- Siminerio, L. M., & Koerbel, G. (2000). A diabetes education program for school personnel. *Practical Diabetes International, 17*(6), 174–177. doi:10.1002/1528-252x(200009)17:6<174::aid-pdi105>3.0.co;2-4
- Smith, C. T., Chen, A. M., Plake, K. S., & Nash, C. L. (2012). Evaluation of the impact of a diabetes education curriculum for school personnel on disease knowledge and confidence

in caring for students. *Journal of School Health*, 82(10), 449-456. doi: 10.1111/j.1746-1561.2012.00721.x

Tables and Figures

Table 1

Demographics of Current Study

Measure	Valid	Frequency	%N
Age	17-22	7	70.0
	23-28	3	30.0
Gender	Male	1	10.0
	Female	9	90.0
Received Training	No	10	100.0
	Yes	0	0
Race	Caucasian	5	50.0
	Latino	3	30.0
	Hispanic	1	10.0
	Mixed Races	1	10.0

Note. N=10

Table 2***Pre- and Post-test Scores: Insulin Dosage and Adjustment***

Measure	Pre-test	% Pre	Post-test	% Post
	Frequency		Frequency	
Sugar Content	9	90	2	20
Carb Content	1	10	8	80
Insulin Adjustment per Carbs	1 - no 9 - yes	90	10 - yes	100

Note. Participants were asked questions 36 and 39 from the Knowledge Survey. These questions analyzed the variable provided by food service manager for insulin dosage and if the administration is reliant on carbohydrates.

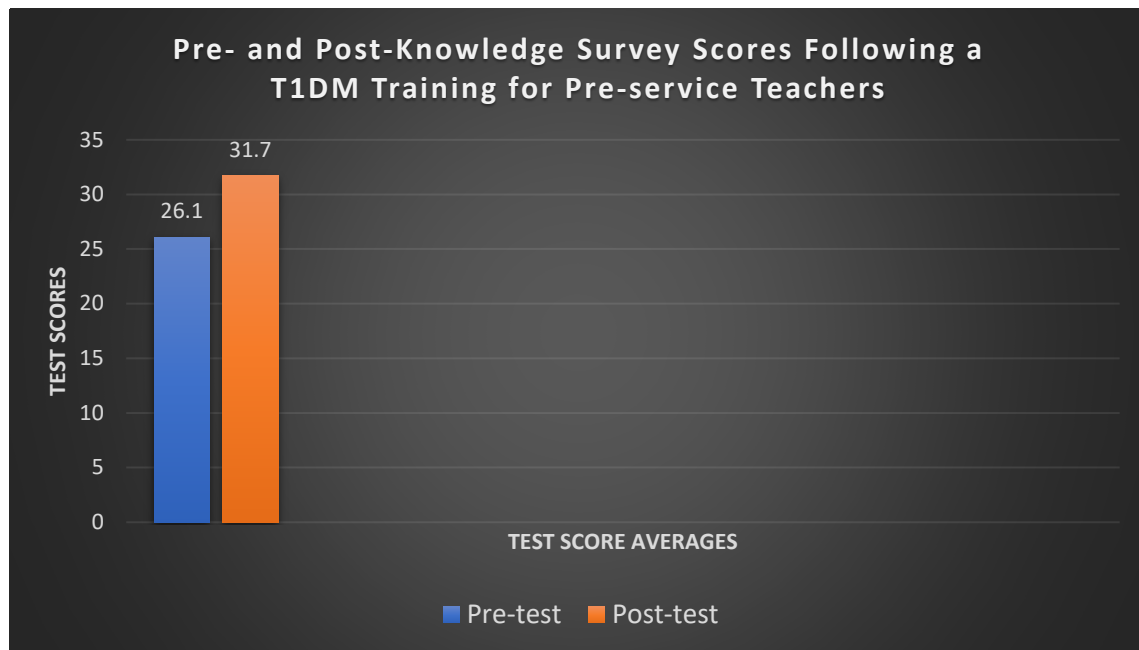
Table 3*Pre- and Post-test Scores: Administer Insulin, Test Glucose, Deliver Snacks*

Measure	Pre-test	% Pre	Post-test	% Post
	Frequency		Frequency	
No	5	50	10	100
Yes	5	50	0	0

Note: N=10. Participants were asked if only the school nurse should be able to administer insulin, test glucose levels, or deliver snacks to students diagnosed with T1DM.

Table 4*Paired Samples Statistics*

Measure	N	Mean	SD	SD Error Mean
Pre-test	10	26.1	3.28126	1.03763
Post-test	10	31.7	2.66875	.84393

Figure 1*Knowledge Survey Test Scores*

Note: The bar graph shows mean averages for the pre- and post-test survey results. Pre-test result average is ($M=26.1;SD\ 3.28$) and post-test average is ($M=31.7;SD\ 2.67$)