Thrive! Positive Psychology Intervention to Treat Diabetes Distress in Teens with Type 1 Diabetes (T1D)

National Clinical Trial (NCT) Identified Number: NCT03845465
Principal Investigator: SARAH JASER
Sponsor: Vanderbilt University Medical Center

Grant Title: Positive Psychology Intervention to Treat Diabetes Distress in Teens with T1D
Grant Number: R01DK121316

Summary of Changes from Previous Version:

Affected Section(s)	Summary of Revisions Made	Rationale
Protocol 10/16/2019	1) Use of econsent documents 2) Updated 18-year-old consent document 3) Revisions to measures (PAID-T and SCI) to reduce subject burden 4) Additional measures to assess secondary outcomes 5) Revisions to health behavior contract to broaden focus to other diabetes management behaviors 6) Revisions to educational materials to improve readability 7) Revisions to positive affect interview materials to improve clarity 8) Revisions to recruitment script to include more information in the initial approach 9) Study flyer	1) Use of econsent forms to reduce paper and simplify enrollment process. 2) Updated 18 year old consent forms to address request from IRB Analyst. 3-8) Measures: Use of shorter, validated measures to assess outcomes to reduce participant burden. 9) Developed study flyer to aid with recruitment.
Protocol 2/18/2020	We reduced the required score on the diabetes distress measure completed by teens. We added a statement in the verbal consent to be able to collect clinical data (A1C) from participants that consent to screen for the study but do not enroll in the study. We are adding questions to the parental demographics survey to include more information about secondary caregivers. We are removing questions related to diabetes	Based on lower than anticipated numbers screening into the study, we propose to reduce the required score on the diabetes distress measure completed by teens. We are adding a statement in the verbal consent to be able to collect clinical data (A1C) from participants that consent to screen for the study but do not enroll in the study. We are adding questions to the parental demographics survey to include more information about secondary caregivers. We are removing questions related to

	device use that have been deemed superfluous or confusing.	diabetes device use that have been deemed superfluous or confusing.
Protocol 4/20/20	1) We added questions to the evaluation to ask about the effects of Covid-19 on the participant's experience. 2) We added an option to send the participant an at home A1C test if they did not have a diabetes clinic visit.	1) In order to understand the impact COVID-19 may have had on diabetes management and mood, we added questions to the teen and parent surveys. 2) Due to the increase in telehealth visits, we are not able to obtain point-of-care A1C values from all participants. By sending at-home A1C test kits, we will reduce missing data.
Non-Compliance 11/2/2020	8 participants (4 dyads) were given the incorrect compensation due to incorrect record keeping of Amazon gift card serial numbers. Gift cards worth $20 were incorrectly recorded by study personnel as worth $30. Therefore, $20 compensation was given to 4 dyads instead of the sufficient amount of $30. The study coordinator at Children's National contacted each affected participant and sent the additional $10 gift cards once the error was detected.	
Protocol 11/2/2020	Participants who use/have used a continuous glucose monitor (CGM) are given the option to participate in an ancillary study to take part in qualitative interviews about CGM use and reasons for starting and stopping use.	This ancillary study will use qualitative interviews to explore the use of CGM in teens.
Protocol 3/23/2021	We created a recruitment video that is used to give information to prospective participants about our study. We have also drafted language for distributing information about our study on Research Match and the Vanderbilt Research Notifications Distribution list to expand our recruitment efforts.	Additional recruitment efforts to boost enrollment.
Non-Compliance/ Continuing Review 5/17/2021	Many participants were recruited and enrolled through remote method due to Covid-19 restrictions. The HRPP allowed this change without prior approval due to extenuating circumstances. This protocol deviation detailed the covid-related changes we made.	Covid changes in this protocol deviation included the following: Rather than approaching patients in clinic, we used Epic to track which patients were attending appointments through telehealth and called them to recruit for the study. Eligibility surveys were sent through email provided by the participant at the time of the call. – Rather than enrolling participant in the clinic, we enacted the same study protocols over zoom and sent study surveys through email.
Measures 8/26/2021	We added questions to the parental COVID-19 supplemental measure. We are asking participants if any adults (18+) and children (12-17) have been vaccinated in their household. Also, we are asking if their child has seen their	To remain current on how COVID-19 is affecting study participants, we added additional questions to our COVID-19 survey measure related to COVID-19 vaccination status and the use of telehealth clinic visits. Many COVID-19 restrictions currently in place (locally and

	diabetes provider via telehealth visit since this could impact their quality of care and one of our specific study aims (glycemic control). These changes were only applied to the parent surveys.	domestically) are dependent on vaccination status, so these questions will help us to interpret findings related to the effects of COVID-19 on diabetes management and mood.

STATEMENT OF COMPLIANCE

1. The trial will be carried out in accordance with International Council on Harmonisation Good Clinical Practice (ICH GCP) and the following:
    - United States (US) Code of Federal Regulations (CFR) applicable to clinical studies (45 CFR Part 46, 21 CFR Part 50, 21 CFR Part 56, 21 CFR Part 312, and/or 21 CFR Part 812).

    National Institutes of Health (NIH)-funded investigators and clinical trial site staff who are responsible for the conduct, management, or oversight of NIH-funded clinical trials have completed Human Subjects Protection and ICH GCP Training.

INVESTIGATOR'S SIGNATURE

Principal Investigator or Clinical Site Investigator:

Signed: Sarah S. Jaser Date: 4/22/2019
Name*: Sarah S. Jaser
Title*: Associate Professor of Pediatrics

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For multi-site studies, the protocol should be signed by the clinical site investigator who is responsible for the day to day study implementation at his/her specific clinical site:

Signed: Date:
Name: Randi Streisand, PhD
Title: Professor of Pediatrics
Affiliation: Children's National Medical Center

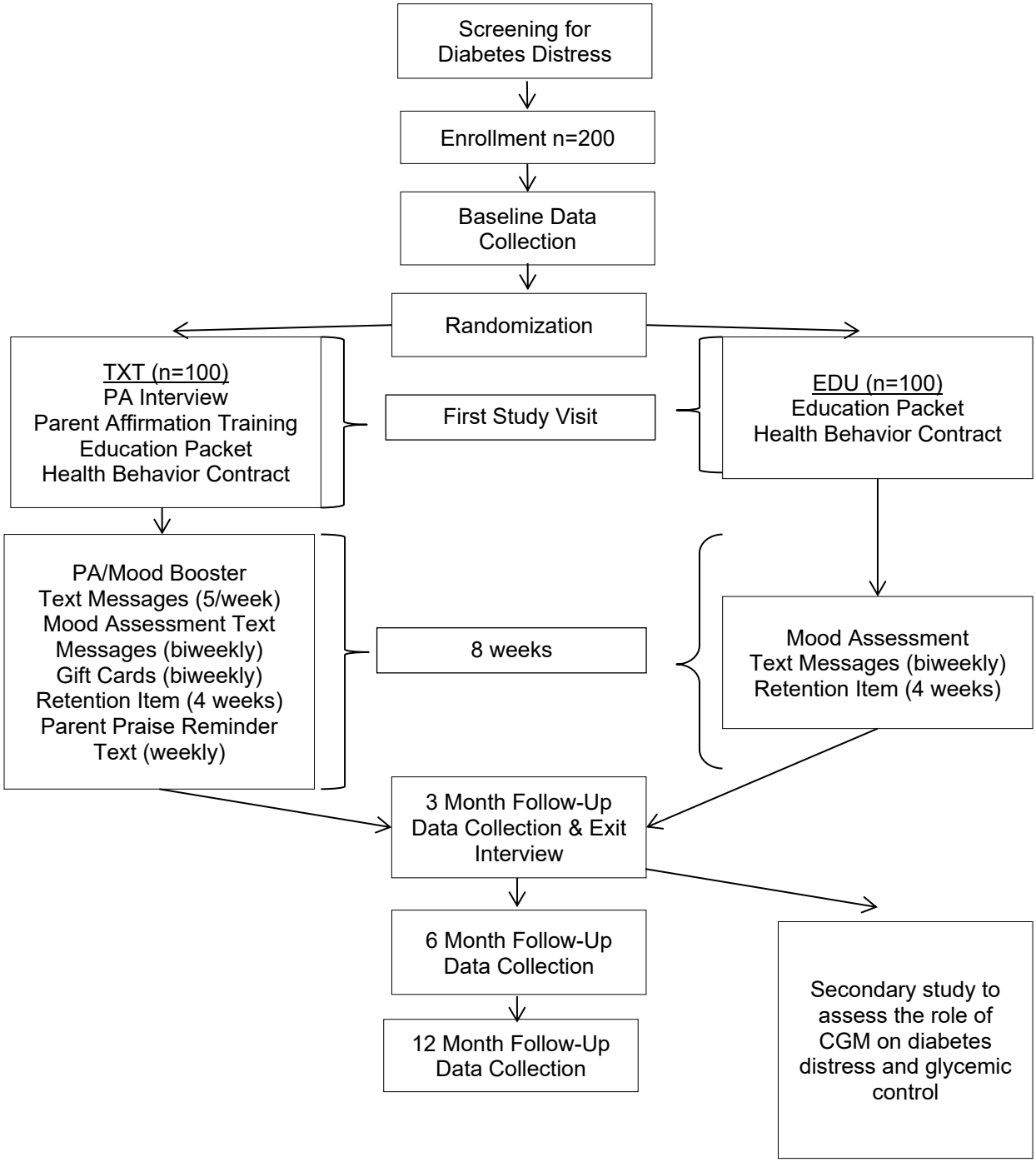
1 PROTOCOL SUMMARY

1.1 SYNOPSIS

Title:	Thrive! Positive Psychology Intervention to Treat Diabetes Distress in Teens with Type 1 Diabetes (T1D)
Grant Number:	R01DK121316
Study Description:	The proposed study will conduct a multi-site, randomized trial to test the effects of a positive psychology intervention aimed at treating diabetes distress and improving glycemic outcomes.
Objectives*:	Primary Endpoint: Glycemic control (HbA1c) Secondary Endpoints: Diabetes Distress Coping Positive Affect Diabetes Management Quality of Life Family Conflict
Endpoints*:	Primary Endpoint: 3 months Secondary Endpoints: 6 months 12 months
Study Population:	Adolescents with type 1 diabetes
Phase* or Stage:	Phase 2
Description of Sites/Facilities Enrolling Participants:	Vanderbilt University Medical Center Children's Diabetes Program Children's National Medical Center Diabetes Program
Description of Study Intervention/Experimental Manipulation:	The intervention is aimed at inducing positive affect to treat diabetes distress. Adolescents will complete a positive affect interview at baseline. They will receive automated text messages 5 days/week for 8 weeks. Messages will be tailored to include adolescents' responses to the baseline interview, including reminders to engage in gratitude and self-affirmation. Additionally, to induce positive mood they will be texted gift cards codes valued at $5.00. Further, parents will be asked to provide weekly positive affirmations to their adolescents, focused on non-diabetes strengths. After completing the exit interview participants will be given the option to participate in an interview exploring the role of continuous glucose monitors on diabetes distress and glycemic control.
Study Duration*:	4 years

Participant Duration: 12 months

1.2 SCHEMA



1.3 SCHEDULE OF ACTIVITIES

	Screening	Visit 1	8 Week Intervention Period	Visit 2 (3 months)	Visit 3 (6 months	Visit 4 (12 months)
Diabetes Distress	x					
Informed Consent/Assent		x				
Outcome Evaluation						
Clinical Data (A1C, BG data)		x		x	x	x
Adolescent Questionnaires		x		x	x	x
Parent Questionnaires		x		x	x	x
Randomization		x				
Health Behavior Contract		x				
Educational Materials		x				
Positive Affect Interview		x				
Automated Text Messages			x			
Exit Interview				x		
Optional CGM interview				x (after visit 2)		
Adverse Events Reporting		x	x	x	x	x

2 INTRODUCTION

2.1 STUDY RATIONALE

In line with the American Diabetes Association's recommendation to assess for and address diabetes distress, the proposed project will focus on treating adolescents who report at least moderate levels of distress. We will use a positive psychology framework, which emphasizes positive emotions and strengths rather than problems, to treat diabetes distress and improve glycemic outcomes. Positive affect, defined as feelings that reflect pleasurable engagement with the environment (e.g., happy, cheerful, proud), predicts favorable health outcomes, especially in health conditions that have a behavioral component, like diabetes. Backed by empirical evidence from basic behavioral science, the Broaden and Build Theory posits that increased positive affect increases people's ability to use complex coping strategies, such as problem solving and cognitive reframing, which are needed for the complex demands of diabetes management. The current study is based on the premise that, by boosting positive affect in teens with diabetes, we will enhance the use of adaptive coping strategies and reduce diabetes distress, thereby improving glycemic control.

2.2 BACKGROUND

Adolescents with type 1 diabetes (T1D) face increased risk for problems with management and deteriorating glycemic control, with only 17% of adolescents meeting the recommended target for hemoglobin A1C. Diabetes distress, or emotional distress related to the burden of living with diabetes, has been strongly associated with poor glycemic control and quality of life in adolescents. Unlike depression, which is episodic in nature, studies in adults with T1D show that diabetes distress remains stable over time without intervention.(4) Further, people who experience even moderate levels of diabetes distress have problems with diabetes management and glycemic control. While psychoeducational interventions have been proven to reduce diabetes distress in adults with T1D, to our knowledge, none have directly targeted diabetes distress in teens, and few have used positive psychology approaches. Thus, there is a need for novel approaches targeting diabetes distress to improve diabetes outcomes in adolescents with T1D.

3 OBJECTIVES AND ENDPOINTS

OBJECTIVES	ENDPOINTS	JUSTIFICATION FOR ENDPOINTS	PUTATIVE MECHANISMS OF ACTION
Primary			
Glycemic Control (HbA1c)	Baseline, 3 months, 6 months, 12 months	Corresponding with diabetes clinic visits	
Secondary			
Diabetes Distress, Positive Affect, Coping, Diabetes Management, Quality of Life, Family Conflict, Resilience	Baseline, 3 months, 6 months, 12 months		
Tertiary/Exploratory			
Demographics (adolescent age, sex), use of diabetes devices	Baseline		

4 STUDY DESIGN

4.1 OVERALL DESIGN

To test the effects of the proposed intervention, we will recruit a sample of 200 adolescents with T1D and their parents from two clinical sites (Vanderbilt University Medical Center and Children's National Medical Center, 100 dyads from each site). Adolescents will be eligible if they (1) are between the ages of 13-17; (2) have been diagnosed with T1D for at least 12 months; (3) score above the clinical cutoff on a screening tool for diabetes distress; and (4) speak and read English. The sampling goal for this study across the two sites is 68% white, 10% Hispanic, 16% Black, and 6% Asian, with equal numbers of boys and girls, in line with recent studies conducted in these settings.

If the adolescent is eligible, the RA will obtain informed consent/assent, and the adolescent and his/her parent will complete the baseline measures. Participants will then be randomly assigned to one of two conditions: Positive Affect and Education (n=100) or Education only (n=100). Randomization will be stratified by use of diabetes devices (insulin pump and CGM), to avoiding confounding effects. A computer program will generate the randomization scheme.

After completing the exit interview, participants who use/have used a continuous glucose monitor (CGM) will be offered the opportunity to participate in a secondary study to discuss the role of CGM in their diabetes management.

4.2 SCIENTIFIC RATIONALE FOR STUDY DESIGN

The age range (13-17) was chosen because it captures a key developmental stage, during which glycemic control often deteriorates. Adolescents who have been diagnosed with diabetes for at least 12 months will be studied to avoid confounding the effects of the initial adjustment period after diagnosis. A validated scale of diabetes distress in adolescents, the Problem Areas in Diabetes-Teens scale (PAID-T), will be used to screen adolescents for DD. A parent/Legally Authorized Representative will be eligible if he/she is currently living with the adolescent.

4.3 JUSTIFICATION FOR INTERVENTION

Education Only Intervention (EDU)**:**

The control condition (EDU) was selected based on positive affect studies in adults with chronic health conditions. Adolescents randomized to the EDU intervention will complete a health behavior contract, which has been shown to improve diabetes management in other studies of adolescents with T1D. The health behavior contract states the behavior that they are committing to do (e.g., check blood glucose 4 times/day), when they will do it (e.g., before meals and before bedtime), and how often they will perform the target behavior (e.g., daily). They will also receive an education packet (14 pages) based on content from the American Diabetes Association website: www.diabetes.org) with appealing graphics and simple language. Additionally, adolescents will receive a retention item halfway through the 8-week intervention period.

PA + Education Texting Intervention (TXT):

In addition to completing the health behavior contract, adolescents randomized to the PA + Education intervention condition will complete the Positive Affect Interview developed in our pilot work. During the first study visit, a trained RA will guide the adolescents through the following empirically-validated

exercises to induce positive affect, and their answers will be included in the tailored text messages (see Table 1 for a description of PA components):

1. Gratitude: Adolescents will be told that research shows that feeling happy helps people to handle challenges in their lives. We will ask them, "what are some small things that make you feel good, even for a few minutes (e.g., hearing your favorite song?"). Based on their answers, they will receive tailored text messages (updated weekly with new responses). "Last week you said [MUSIC] made you happy. Have you noticed that this week, even for a few minutes? (Please reply) Is there something else that has made you feel happy this week? Please reply yes or no (if yes: What is it?) That's great!"

2. Self-Affirmation: Adolescents will choose from a list of Important Values, based on self-affirmation studies conducted with adolescents: Enjoying Sports, Art, Working Hard in School, Having a Sense of Humor, Being Creative, Belonging to a Social Group or Club, Following Politics or Current Events, Relationships with Friends, Relationships with Family, Faith or Spirituality, Music. The important value selected by adolescents will be piped into their tailored text messages. "You mentioned that [ART] was important to you. And I asked you to think about that when it was hard for you to take care of diabetes. Have you done that this week? (Please reply). Remember, focus on [ART] when it is time to take care of diabetes!

3. Mood Boosters: Adolescents will also receive brief messages intended to boost their mood, similar to those used in other studies. In our pilot work, we asked teens to rate potential mood booster messages, consisting of inspirational quotes (e.g., "Keep your eyes on the stars and your feet on the ground - Theodore Roosevelt") or jokes (e.g., "Q: What's the difference between a fish and a guitar? A: You can't tuna fish"). Based on their responses, we created Mood Booster message banks for younger teens (ages 13-14) and older teens (ages 15-17) consisting of the highest-rated messages.

4. Unexpected Gifts: Adolescents will be sent an e-gift card code (worth $5.00) biweekly as another way to increase positive affect. Gifts that are viewed as useful and "delightful" are most effective at inducing positive affect; they do not have to be valuable. In exit interviews conducted during the pilot studies, adolescents reported using Amazon gift cards to download music, videos, and purchase small items, such as socks.

5. Parental Affirmation: We will ask parents to provide praise or positive messages to their adolescents, focused on non-diabetes strengths (e.g., "I heard you practicing your guitar – sounded great!" or "I had a great time when we _____.") Based on feedback from our pilot studies, we developed a protocol to instruct parents on the types of messages to send, including feedback on a sample message, to ensure that messages are consistent with the study goals. Parents will receive weekly text reminders at preferred times. By asking parents to provide affirmations rather than reminders for diabetes management, we hope to minimize parent-child conflict around diabetes care.

5 STUDY POPULATION

5.1 INCLUSION CRITERIA

In order to be eligible to participate in this study, an individual must meet all of the following criteria:

- Age 13-17
- Diagnosed with type 1 diabetes for at least 12 months
- Speak and read English
- Report at least moderate diabetes distress on the Problem Areas in Diabetes Scale - Teen version

5.2 EXCLUSION CRITERIA

An individual who meets any of the following criteria will be excluded from participation in this study:

1. Currently participating in another intervention
2. Other serious health conditions that interfere with diabetes management

5.3 STRATEGIES FOR RECRUITMENT AND RETENTION

Enrollment. We will recruit a sample of 200 adolescents with T1D and their parents from two clinical sites (Vanderbilt University Medical Center and Children's National Medical Center), 100 from each site. The sampling goal for this study across the two sites is 68% white, 10% Hispanic, 16% Black, and 6% Asian, with equal numbers of boys and girls, in line with recent studies conducted in these settings. We will employ a method of enrolling subjects that has been evaluated and refined as part of our prior work.

At CNMC, there are currently **614 active patients** with T1D between the ages of 13-17 years, and there are no current competing studies within this age group. The adolescent patient population is 47% female and 52% Caucasian. Thus, CNMC is well-positioned to provide an adequate and diverse sampling of participants for the proposed study.

At VUMC, there are currently **1100 active patients** between the ages of 13-17, and the adolescent patient population is 48% female and 75% Caucasian. Thus, we do not anticipate difficulty in meeting our enrollment goals.

We created recruitment videos to explain the study in a brief and engaging format: https://youtu.be/lQT4REEruoQ (VUMC); https://youtu.be/Uinw_a8_5Lo (CNH)

We will also use Research Match and the Vanderbilt Research Notifications Distribution list to reach more potential VUMC participants.

After completing visit 2 (3 month follow up data collection and exit interview) we will invite 20 youth participants who currently use/have used a CGM to participate in an optional interview to describe the role of CGM on their diabetes management.

Screening. We will screen adolescents for diabetes distress using a validated measure, the Problem Areas in Diabetes-Teens scale (PAID-T). In order to meet our enrollment goals, enrolling 4-5 per month per site, we will plan to screen 10-12 families per week.

Retention & Follow-Up**:** Efforts will be made to maximize retention across trial assessments. These include providing study retention items (e.g., keychain flashlights, laptop decals with the study logo), sending birthday cards to trial participants, and verifying contact information, including email addresses and phone numbers, at each assessment point. As in previous studies, we will attempt to collect follow-up data in person during regularly scheduled clinic appointments. Prior to their scheduled appointment, families will be reminded of the visit and asked to come early or stay after their appointment. If families cancel or do not show for their appointments, we will email and text a unique link to the REDCap survey and continue to follow up by phone and email until surveys are completed. We will give the family the option of doing a Coremedica HemaSpot-SE HbA1c kit at home if they are unable to come into the clinic to get a point of care A1c test. If families are not responsive, we will send a paper packet with a self-addressed, stamped envelope. These methods have resulted in excellent retention rates (91-98%) in our pilot studies. We will actively work towards maintaining families' participation in data collection regardless of their engagement in the text messages so that intent-to-treat analyses may be conducted. We are conservatively planning for a ~15% attrition rate based on data from our pilot studies to protect against overestimation.

Incentives. In order to promote the completion of trial measures at all assessment points, participants will be compensated for their time at each data collection, with increasing compensation ($20, $25, $30, $30) to improve retention. In addition, participants will receive $10 for participating in a qualitative exit interview at the 3-month data collection. Participants who complete the secondary study (interview describing their CGM use) will receive an additional $30 gift card.

6 STUDY INTERVENTION(S) OR EXPERIMENTAL MANIPULATION(S)

6.1 STUDY INTERVENTION(S) OR EXPERIMENTAL MANIPULATION(S) ADMINISTRATION

Eligible families will be asked to stay after their appointment to complete enrollment, or they may choose to come back for a study visit. Trained study staff will describe the study in detail to interested families. They will be encouraged to ask questions before giving consent. After obtaining informed consent/assent, adolescents and parents will complete a battery of self-report measures (see below) and will be randomized to the Positive Affect plus Education texting condition (TXT) or the Education only condition (EDU). Adolescents and parents will complete measures again 3 months, 6 months, and 12 months during regularly scheduled clinic visits.

Adolescents and their parents will complete measures on a tablet using REDCap, an electronic database. The survey completion is expected to take 30 minutes.
After completing baseline data, adolescents will be randomized to either the Education group or the text-messaging Positive Affect + Education group (TXT).

6.1.1 Study Intervention or Experimental Manipulation Description

Participants randomized to the EDU group will complete a behavioral health contract. The health behavior contract states the behavior that they are committing to do (e.g., check blood glucose 4 times/day), when they will do it (e.g., before meals and before bedtime), and how often they will perform the target behavior (e.g., daily). They will also receive a 14-page educational packet, with age-appropriate information from the American Diabetes Association website on the following topics: understanding A1C, driving and diabetes, hyper- and hypoglycemia, and sports and exercise.

Participants randomized to the TXT group will complete a behavioral health contract. They will also receive an educational packet, with age-appropriate information from the American Diabetes Association website (e.g., understanding A1C, driving and diabetes). Adolescents in the TXT group will also complete a positive affect interview at baseline with a trained research assistant. During the positive affect interview, adolescents will be asked to list three things that make them feel good, even for just a few minutes. Next, they will be asked to choose two to three values that they personally found to be most important from the following list: Enjoying Sports, Art, Working Hard in School, Having a Sense of Humor, Being Creative, Belonging to a Social Group or Club, Following Politics or Current Events, Relationships with Friends, Relationships with Family, Faith or Spirituality, Music. The adolescents will write a few short sentences about why those values are important to them, and to provide an example of a time they accomplished something or had a good experience related to that value. Further, parents will be asked to provide positive affirmations (praise or positive messages) to their adolescents, focused on non-diabetes strengths. Parents will be given examples of messages and asked to write a sample positive message. The trained research assistant will give parents feedback on their messages to ensure that they meet the requirements.

A brief assessment of positive affect (Positive and Negative Affect Scale -- Child -- Short Form), consisting of 10 items, will be obtained from all adolescents via automated text messaging twice/month during the 8-week intervention. All adolescents will also be sent a retention item (e.g., laptop decal) halfway through the 8-week intervention period.

Follow-up data (self-report measures and clinical data) will be collected at 3 months, 6 months, and 12 months after enrollment in REDCap. In addition, teens and parents will be invited to participate in an exit interview at the 3-month follow-up data collection.

After completing the exit interview participants who currently use or have used a CGM will be offered the opportunity to participate in a secondary study to understand how adolescents use CGM to manage their diabetes. This will be a 1 time zoom interview that lasts approximately 45 minutes.

6.1.2 Administration and/or Dosing

Adolescents in the TXT group will receive automated text messages 5 days/week for 8 weeks. Messages will be tailored to include adolescents' responses to the baseline interview, including reminders to engage in gratitude and self-affirmation. Gratitude messages (e.g., "Last week you said [response from gratitude exercise] made you happy. Have you noticed that this week, even for a few minutes?") will be sent once/week. Important value messages (e.g., "You mentioned that [response from values exercise] was important to you, and I asked you to think about that when it was hard for you to check your blood sugar. Have you done that this week?") will be sent once/week. Mood Booster messages will be sent 2-3 times/week. Mood Boosters include inspirational messages (e.g., "Believe you can, and you're halfway there!") and humorous messages (e.g., "Which hand is it better to write with? A: Neither, it's best to write with a pen!"), based on earlier work to obtain teens' ratings of messages. Younger teens (age 13-14) will receive some different messages than older teens (age 15-17), based on ratings. Additionally, to induce positive mood, teens will be texted gift cards codes valued at $5.00 on alternating weeks. Parents will receive weekly text message reminders to provide positive messages to their teens.

6.2 FIDELITY

6.2.1 INTERVENTIONIST TRAINING AND TRACKING

Trained Key Study Personnel will administer the health behavior contract and conduct the positive affect interview.

6.3 MEASURES TO MINIMIZE BIAS: RANDOMIZATION AND BLINDING

The randomization scheme will be determined by the biostatistician, and adolescents will be stratified by diabetes device use (insulin pumps, continuous glucose monitors).

7.1 DISCONTINUATION OF STUDY INTERVENTION/EXPERIMENTAL MANIPULATION

If participants ask to be withdrawn from the study, the reason(s) for discontinuing the participant from the intervention, and methods for determining the need to discontinue will be documented in the study record.

7.2 PARTICIPANT DISCONTINUATION/WITHDRAWAL FROM THE STUDY

Participants are free to withdraw from participation in the study at any time upon request.
An investigator may discontinue a participant from the study for the following reasons:

- Significant study intervention non-compliance
- Lost-to-follow up; unable to contact subject
- Any event or medical condition or situation occurs such that continued collection of follow-up study data would not be in the best interest of the participant or might require an additional treatment that would confound the interpretation of the study
- The participant meets an exclusion criterion (either newly developed or not previously recognized) that precludes further study participation

The reason for participant discontinuation or withdrawal from the study will be recorded in the REDCap database. Subjects who sign the informed consent form and are randomized but do not receive the study intervention may be replaced. Subjects who sign the informed consent form, and are randomized and receive the study intervention, and subsequently withdraw, or are discontinued from the study, will not be replaced.

7.3 LOST TO FOLLOW-UP

A participant will be considered lost to follow-up if he or she fails to return for 2 scheduled visits and study staff are unable to contact the participant after at least 3 attempts.
The following actions must be taken if a participant fails to return to the clinic for a required study visit:

- The site will attempt to contact the participant, reschedule the missed visit within 2 weeks, counsel the participant on the importance of maintaining the assigned visit schedule and ascertain if the participant wishes to and/or should continue in the study
- Before a participant is deemed lost to follow-up, the investigator or designee will make every effort to regain contact with the participant (where possible, 3 telephone calls and text messages and, if necessary, a certified letter to the participant's last known mailing address or local equivalent methods). These contact attempts will be documented in the participant's medical record or study file.

- Should the participant continue to be unreachable, he or she will be considered to have withdrawn from the study with a primary reason of lost to follow-up

8 STUDY ASSESSMENTS AND PROCEDURES

8.1 ENDPOINT AND OTHER NON-SAFETY ASSESSMENTS

Follow-up data will be collected at 3 months, 6 months, and 12 months.

8.2 SAFETY ASSESSMENTS

n/a

8.3 ADVERSE EVENTS AND SERIOUS ADVERSE EVENTS

8.3.1 DEFINITION OF ADVERSE EVENTS

This protocol uses the definition of adverse event from 21 CFR 312.32 (a): any untoward medical occurrence associated with the use of an intervention in humans, **whether or not considered intervention-related.**

8.3.3.1 SEVERITY OF EVENT

For adverse events (AEs) not included in the protocol defined grading system, the following guidelines will be used to describe severity.

- **Mild:** Events require minimal or no treatment and do not interfere with the participant's daily activities.
- **Moderate:** Events result in a low level of inconvenience or concern with the therapeutic measures. Moderate events may cause some interference with functioning.
- **Severe:** Events interrupt a participant's usual daily activity and may require systemic drug therapy or other treatment. Severe events are usually potentially life-threatening or incapacitating.

8.3.2 ADVERSE EVENT REPORTING

The PI will be responsible for reporting AEs according to policies and procedures.

9 STATISTICAL CONSIDERATIONS

9.1 STATISTICAL HYPOTHESES

- Primary Efficacy Endpoint(s):

The primary outcome is change in glycemic control (A1C). To test Aim 1, a linear mixed effects regression model will be used to estimate the effect of intervention over time on glycemic control (A1C).

- Secondary Efficacy Endpoint(s):

Our secondary outcomes are diabetes distress, coping, and diabetes management. To test Aim 2, separate linear mixed effects regression models will be used to estimate the effect of the intervention over time on diabetes distress (PAID-T), coping (RSQ), and diabetes management (P-SCI, SCI, Checks/Day). Qualitative methods will be used to code data from the secondary CGM interview study into appropriate themes that then guide analysis.

9.2 SAMPLE SIZE DETERMINATION

Power Analysis: We plan to enroll 200 adolescent-parent dyads and conservatively assume a 15% dropout rate, leaving 170 subjects for analysis. Power calculations for the repeated-measures design were conducted using a variety of statistical simulations for each of the outcomes. Inputs into the simulation study, based on preliminary data from 46 subjects measured 3 months apart, were baseline mean, baseline standard deviation, and correlation between baseline and 3-month measurement. Table 3 summarizes the effect sizes that we will have at least 90% power to detect at a 0.05 significance level.

9.3 STATISTICAL ANALYSES

9.3.1 General Approach

Outcomes will be measured at up to four time-points per subject (baseline, 3 months, 6 months, and 12 months), so we will use time, treatment group and the interaction of treatment with time serving as the main explanatory variables. Such a model will allow us to test for any differences between treatment and control groups at 3, 6 or 12 months while accounting for baseline values. While the randomized block design should minimize confounding, we will adjust for age, sex, and race/ethnicity to improve precision. The results from the adjusted and unadjusted models will be compared with respect to their estimates of the treatment effects. We will include a random intercept to account for within-subject correlation arising from taking repeated measurements on the same subject over time. The error structure of the model is assumed to be compound symmetric, and the validity of this assumption will be examined by computing Akaike Information Criteria against other common structures. Subjects will

be included in the analysis if they have an outcome measured at baseline and at least one outcome measured at 3, 6 or 12 months.

9.3.2 Exploratory Analyses

Exploratory Aim: To examine the differential impact of intervention effects across demographic (i.e., age, race/ethnicity, sex) and treatment variables (i.e., diabetes devices), we will examine these factors as potential moderators of the intervention effects.

Power to detect if the treatment effect is modified by age, sex, race, or treatment type will depend on the frequency of these factors in the sample. In pilot data, we found the frequencies to be 50% male, 60% pump treatment type, and 67% white (EA), and for age we present result where age is dichotomized at its median.

The size of the effect modification that we can detect with 80% power for each outcome and effect modifier is presented in the following table. The detectable effect sizes for effect modification at 80% power are similar to the effect sizes for the treatment at 90% power. The effect modification power table assumes 200 subjects with 15% dropout (170 subjects analyzed) and a significance level of 0.05.